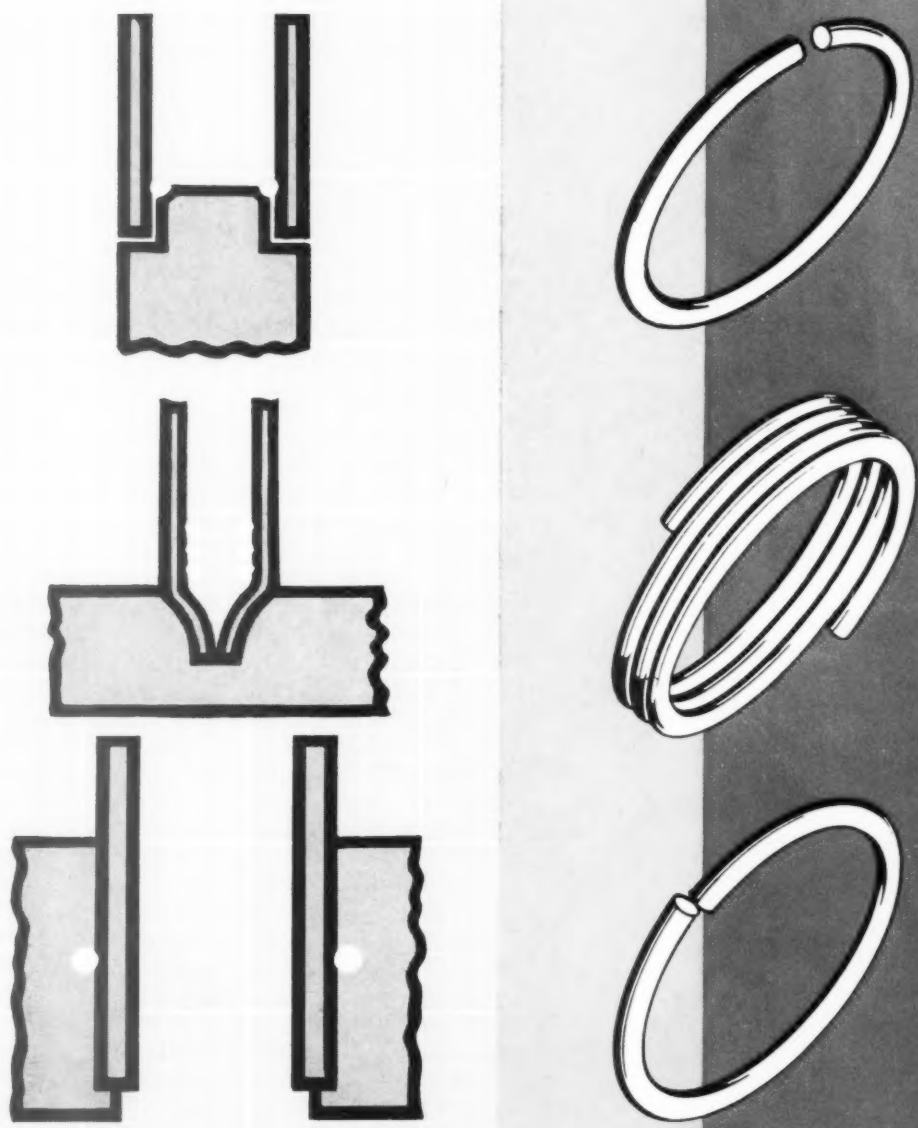
A HITCHCOCK PUBLICATION

assembly & fastener ENGINEERING

APRIL · 1960



Designing for Silver Preform Brazing

Also in this Issue: **High Strength Structural Bolting**
Bonding Honeycomb Structural Materials
Controlled Flexibility for a Volume Assembly Line

and here's how Pheoll solved it

He's skimming the surface now—yet a short time ago this design engineer was "knee-deep" in a 2-way fastener problem: First, how to hold a board absolutely rigid against the flange guide of a table saw; and second, how to produce the fastener on a simplified and economical basis. Originally, his company tried using an ordinary "C" clamp, but later switched to a hand-assembled 3-piece post clamp. This too proved costly and inadequate.

Pheoll came into the picture and immediately reduced material costs and eliminated a bending operation; replacing a four slide part with a cold headed thumb screw. Then Pheoll dog-pointed and end-drilled the bottom of the thumb screw which allowed the attachment of a permanent spinning grip washer. Previously, this piece consisted of three parts manufactured by three separate industries.

Pheoll automatically produced and assembled the one-piece unit, shipping it to the table saw manufacturer at lower costs—with none of the previous manufacturing, assembly or inventory problems. *This is Pheoll in action*—a versatile, cost-conscious, quality-minded team ready to serve you...the next time you have a fastener problem.

PHEOLL

HEADING THE FASTENER INDUSTRY FOR OVER 50 YEARS

Pheoll Manufacturing Company, Inc.

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assembly & fast… ENGINEERI…

April, 1960 Volume 3, Number 4

FEATURES

Designing for Silver Brazing with Preforms 32
Design considerations and examples of metal joints which lend themselves to preform brazing.

High Strength Structural Bolting 39
A cost report which shows why bolting is now the preferred fastening method in structural steel fabrication.

What's Behind the High Strength Bolt? 41
A background report from the American Institute of Steel Construction.

Controlled Flexibility for Volume Assembly 44
Presenting examples of methods standardization and material control which can be adapted in any plant, large or small.

Bonding Honeycomb Structural Materials 48
Here's a how-to-do-it article based on the experience of Monrovia Aviation.

Why Tighten a Bolt? 54
Some factors to consider in preventing fatigue in threaded fasteners.

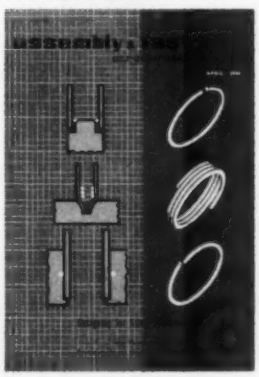
Riveting and Bonding Door and Sash 57
A small firm finds blind riveting and bonding can cut costs and improve quality.

Tooling for Feeding Extruded Washers 60
A report on tooling for delivering flanged washers bottom-side up to assembly machine head.

DEPARTMENTS

2 Letters to the Editor
9 The Editor's View
11 The State of Business
15 Industry at Work
21 Assembly & Fastening Ideas
27 Reports from the Field
63 What's New in Equipment
73 What's New in Fasteners
83 Useful Literature
103 Product Index
106 One Last Word

• Brazing alloys in preformed shapes can help cut costs and improve product design. For examples of how brazing preforms can be used, turn to the article starting on page 32.



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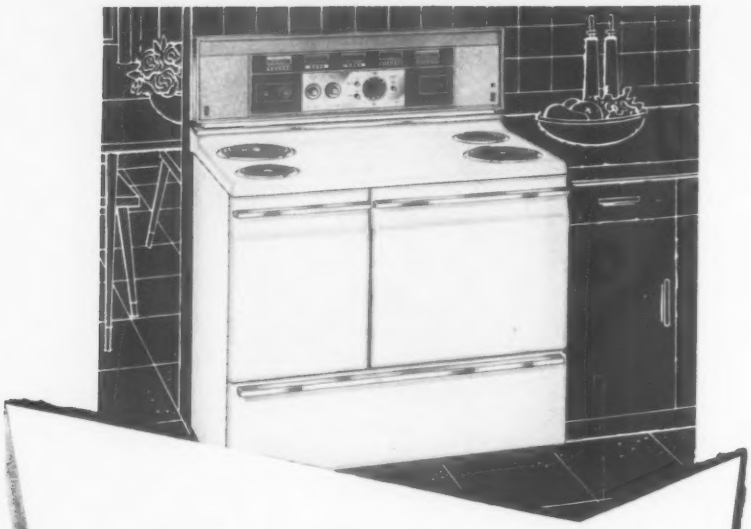

Hotpoint relies on . . .

FEDERAL-WARCO

Federal Multi-gun, combination spot and projection welders are a vital link in the exacting production schedules of Hotpoint ranges. The Federal unit shown below welds and forms range frames—adjusts to accommodate five cabinet sizes—maintains high Hotpoint volume without sacrificing quality standards.

Leading metal fabricators throughout the country have learned they can rely on Federal resistance welders and Warco mechanical presses for dependable high speed performance. Precision engineered to your exact requirement by

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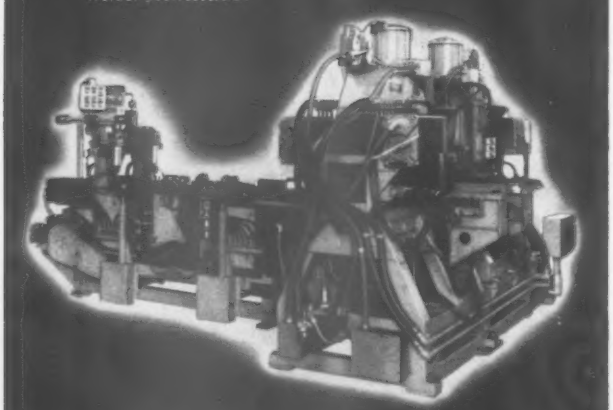

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Letters to the Editor

Suggests H28 Handbook Revision

Can and should the format of Handbook H28 (Screw Thread Standards for Federal Services) be changed to increase its effectiveness and efficiency in use? My reply is yes. My suggestions and reasons, based on many years of H28 use, are as follows:

The book-bound form restricts the maintenance of H28 in current validity. H28 revisions have been issued (since 1942) at intervals of from two to seven years. Loose leaf binding (a) would allow immediate revision and distribution of pertinent material; (b) would localize the changes, deletions, or additions so that the attention of H28 users would be flagged to such action as might be required to make their plant standards and practices conform; and (c) permit availability of multiple copies of limited portions of H28 for distribution to departments according to their needs and interests.

Each functional activity of thread engineering and production has a major interest in a particular portion of H28 material. For instance, the major interest of the product designer is in types of threads and their limits of size, whereas a primary interest of the gage maker would be in the gage tables. Although there are always related or fringe interests, the material of major interest, normal to the activity, is most used. Segregation of material with respect to functional activities would facilitate the use of H28 in time and effort. In this respect and in outline, the following is offered for consideration:

Category 1—General: History, symbols, definitions, thread designations, etc.

Category 2—Threads: Series, classes, limits of size, and tap drills for all threads.

Category 3—Gages: Types, classes and limits for all threads.

Category 4—Inspection: All information on procedures and practices in inspection of all types of threads and gages.

Category 5—Thread design: Basic formulae, special thread, stress and shear area data, etc., for all threads.

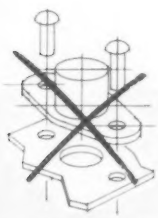
A change to loose-leaf form and functional segregation of material can increase the effectiveness and usefulness of Handbook H28.

H. Schlarman
Mechanical Engineer

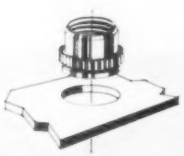
THE ROSÁN PRESS-LOCK PRINCIPLE

RELIABLE THROUGH THICK AND THIN

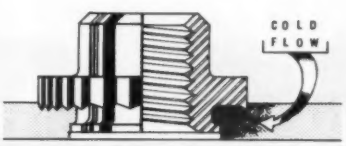
Rosán Press Nuts are now packaged and available in INTRODUCTORY KITS for your design evaluation and test. A trial of the Rosán Press Nuts can effect substantial savings in your prototype and production work.



TYPICAL PLATE NUT INSTALLATION



ROSAN PRESS NUT



INSTALLED PRESS NUT

FASTEN SECURELY WITHOUT RIVETS OR TAPPING

The metal displaced by the knurled flange flows evenly and smoothly around the recessed groove. This cold flow (illustrated left) securely locks the Press Nut and provides high pull out resistance. The embedded flange provides high torque resistance.

ONE HOLE — ONE PART — ONE TOOL

The Rosán Press-Lock Principle is the latest development in fasteners for thick and thin materials. Press Nuts have been approved by the military and standardized by many national defense manufacturing companies.

For price and sizes of the new Press Nut Introductory Kits, write Dept. M-48. Engineering data on other Rosán Press-Lock fasteners (illustrated below) will be provided upon request. *Not available in kits.

PRESS NUT

* FLOATING PRESS NUT

* DOME PRESS NUT

* ROLLED SKIRT PRESS NUT

* PRESS BOLT

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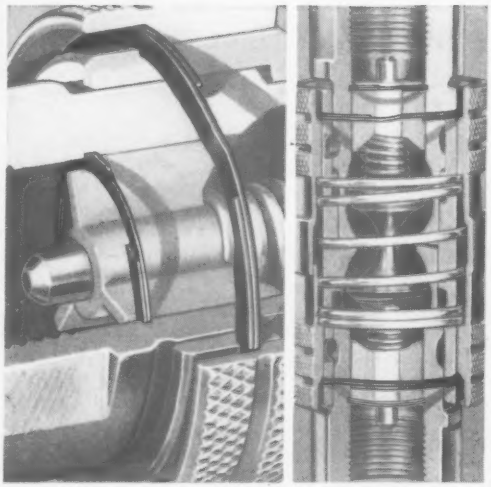
tOtal 2 gives you the Superior Solution!

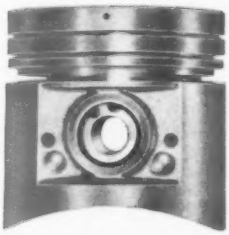


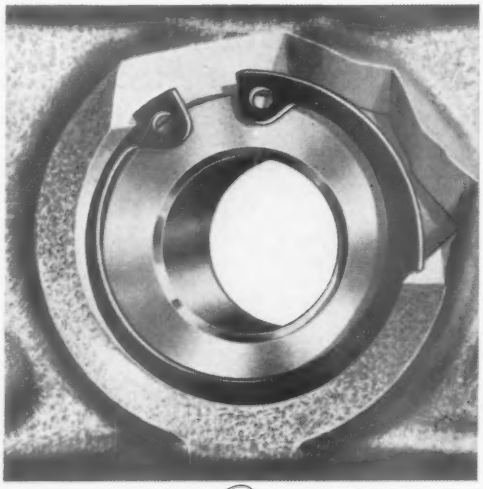
SpirOlox

was the Superior Solution to this application

This unique Ramco design, full-circle 360 degree retaining ring opens up unlimited possibilities for improved design and economies in thousands of new or present products. Check these outstanding features:

- √ Uniform wall allows installation with minimum clearance.
- √ Two turn, full-circle design eliminates gaps.
- √ No special tools needed for installation or removal.
- √ No tooling needed for prototypes.
- √ Develops "friction lock" under load.
- √ Single or multi-turn designs available.
- √ Always uniform in quality.
- √ Special designs for high-speed or tolerance stack-up problems.





CircOlox

was the Superior Solution to this application

This Ring provides the answer to easy, lightweight, low cost assemblies and reduced manufacturing costs. Made in a variety of types and sizes for the smaller shaft or housing diameters. Check these Circolox features:

- √ "Deep-groove" design permits maximum thrust with minimum weight.
- √ Easily installed or removed.
- √ Available in a variety of materials.
- √ Wide choice of finishes available.
- √ Always uniform in quality.
- √ Meet Government and Industry Standards.

You may be passing up important performance advantages by trying to make one type of retaining ring do the job of the two modern types. tOtal 2 means that you have a *choice* of two rings to best fit your particular application . . . to give you the superior solution to your retaining ring problems.

RAMCO

No other retaining ring manufacturer can offer you the advantages of the tOtal 2. Only Ramsey offers the improved die-formed Circolox Ring and the unique, coil-wound Spirolox to cover total retaining ring application needs.

The complete tOtal 2 story is contained in the new Spirolox-Circolox Engineering Manual and Technical Bulletin Service. Mail the coupon below to get your copies without cost or obligation.

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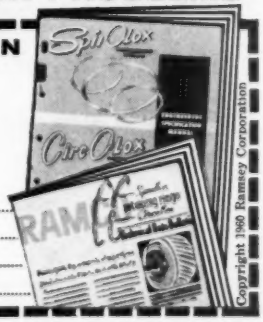

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NOW AVAILABLE!

P-K® SOCKET SCREWS WITH LONG-LOK® INSERTS

Provides high resistance to shock and vibration.

Assures superior thread engagement and locking force.

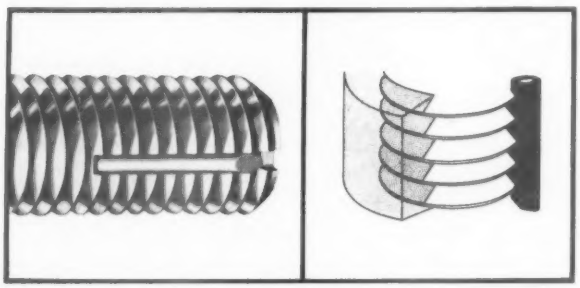
Permits high reusability.

Eliminates lock washers and safety wire.

WHAT IS LONG-LOK?

Long-Lok is an insert which becomes an integral part of the P-K Socket Screw in which it is used. A root-deep axial slot is milled into the external threads of any of the various types of P-K Socket Screws and permanently filled with a specific material engineered for the design application. In use, the insert provides triple locking action: (a) axial tolerance is taken up by the resilient insert material, causing metal-to-metal "drag", (b) radial tolerance is taken up because the side opposite the insert is forced into close contact for additional metal-to-metal "drag", and (c) torsional resistance of the insert itself.

The fastener is easily inserted and started because of the tapered end of the insert. The length of the insert assures full engagement of the locking material and a radial load on mated threads.



In locking and anchoring applications, the insert assures a radial load on mated threads which results in increased contact friction at the thread flanks. Under operating conditions, the friction then prevents relative motion between the mating threaded parts. In sealing applications, the insert is selected and processed to result in a dam which prevents the flow of gas or liquid along the thread helix. Axial of a fluid or gas is prevented by a uniform annular flank-to-flank contact of the mating thread pitches.

HERE ARE SOME OF THE ADVANTAGES!

P-K Socket Screws with Long-Lok Inserts speed-up and improve reliability of assembly operations. The P-K Socket Screw with Long-Lok is not dependent upon seating operations, locking securely wherever installation torque stops. Long-Lok inserts span temperature ranges from –320°F to +1200°F as required; pass through normal clearance hole with ease and install easily because torque forces build up smoothly and gradually all the way.

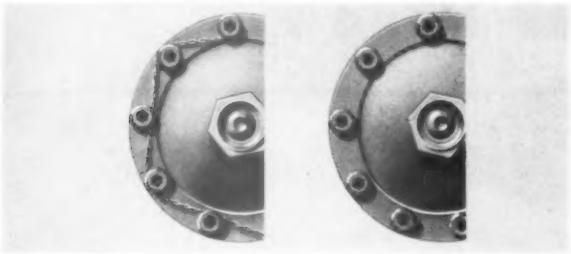
The Long-Lok insert does not protrude, thus P-K Socket Screws with Long-Lok inserts pass through normal clearance holes with finger pressure. No special clearance holes are required. Normal handling or installation will not dislodge inserts.

P-K Socket Screws with Long-Lok inserts make possible a long range of adjustment, and because of the extremely low "cold flow" and exceptional "memory" of the insert material, insure a high degree of reusability. Insert material does not project beyond the basic diameter of the fastener and the slot does not present an abrupt change of section to operating loads. What's more, the small cross sectional area of the insert has no effect upon fatigue strength and does not reduce basic rated tensile strength of the unit.

WHERE SHOULD LONG-LOK BE USED?

In industrial and consumer products—tools, machines, appliances—wherever vibration is present—wherever adjustment may be required—wherever re-use is a factor—wherever the needs of quality control in production are exacting . . . P-K Long-Lok fasteners may be the right answer. In the electronics industry, in engines, hydraulics, valves, optical instruments—even in guided missiles—Long-Lok is building an enviable reputation for reliability.

TIME AND COST REDUCTION



Critical weight and needless man-hours of assembly time can be saved through the use of P-K Socket Screws with Long-Lok inserts. The fasteners are heat, impact, shock and vibration resistant. They completely eliminate the need for intricate and costly safety-wire installations.

In the aircraft industry, fasteners with Long-Lok inserts are an exciting advance—opening up new, faster, safer design opportunities—doing away with costly, intricate safety-wiring operations—resulting in fastenings that stay tight and secure under punishing vibration—under every environmental attack. Long-Lok fasteners are already in use in supersonic applications and meet the requirements of #MIL F 18240A (ASG) and NAS1081 specifications.

In the automotive industry, P-K Socket Screws with Long-Lok inserts will meet every requirement for efficiency and reliability. As an adjustment screw, this new fastener can offer superior performance and in many cases the efficiency of the insert can act as a barrier against fluid leakage, eliminating the need for messy sealing compounds.

HOW IS THE LONG-LOK FURNISHED?

Parker-Kalon Socket Screws with Long-Lok inserts are available in socket head cap screws, set screws, flat head, button head, shoulder screws and pipe plugs. They will be stocked by your P-K Distributor in a range of popular sizes with Polycap (green) inserts. Polycap is a nylon type polymer capable of performing within a temperature range of −120°F to +250°F and recommended for general applications, thread-sealing applications and applications requiring frequent adjustment.

On order, Parker-Kalon will supply Socket Screws with Long-Lok BLUE-KEL-F® inserts, a thermoplastic with zero water absorption for −120F° to −320°F, and for +250°F to +390°F. For use where temperature requirements range between +400°F and +1200°F, Parker-Kalon will furnish Socket Screws with Long-Lok metallic inserts.

A COMPLETE LINE

Parker-Kalon offers a complete line of Socket Head Cap Screws, Shoulder Screws, Button Heads, Flat Heads, Set Screws, Hex Keys and Key Kits, Dowel Pins and Pipe Plugs, as well as the P-K Pre-Lode (1960 Series) Socket Head Cap Screw and the revolutionary new P-K W-Point Socket Set Screw.

SAMPLES AND TECHNICAL DATA MAY BE OBTAINED FROM YOUR P-K INDUSTRIAL DISTRIBUTOR, OR WRITE DIRECTLY TO PARKER-KALON FOR BULLETIN NO. 862.

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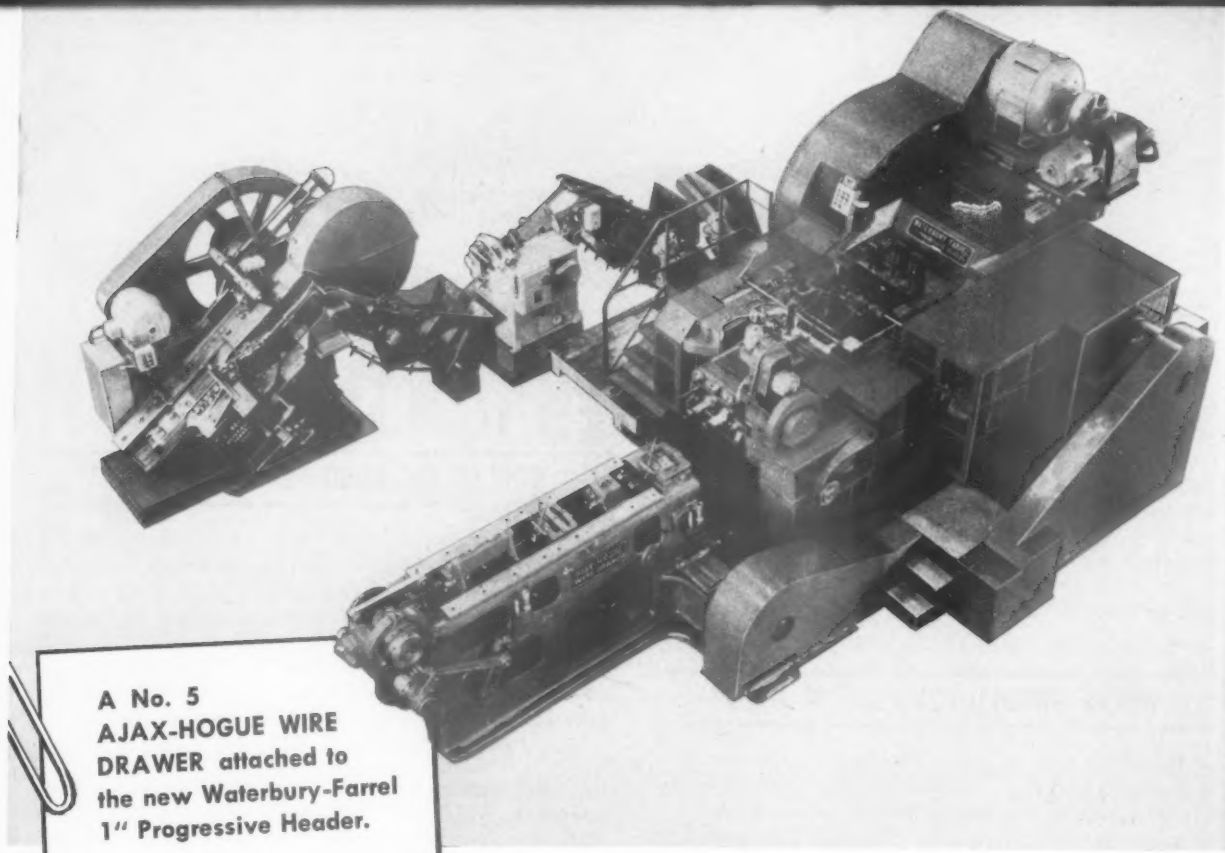

A No. 5 AJAX-HOGUE WIRE DRAWER attached to the new Waterbury-Farrel 1" Progressive Header.

For Quality Production at Lower Cost COLD HEADERS Need . . .

AJAX-HOGUE Wire Drawers

AN ATTACHMENT FOR HEADERS AND COLD NUT FORMERS

THE AJAX-HOGUE WIRE DRAWER is a complete wire drawing unit, custom designed to fit any make cold header or cold nut former. It cold draws wire in a straight line and coats wire from hot-rolled, pickled and limed rod as it feeds into the header. You are sure of uniformly accurate size wire from successive coils. A wire drawer attached to your header assures easier heading, improved products and increased production. *Write for Bulletin 111-A.*

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APRIL, 1960, VOL. 3 NO. 4

NO SUBSTITUTE FOR OEM EXPERIENCE

This is a sequel to one of the editorials in our March issue which probed into "the high cost of cheap fasteners". It was pointed out that when you take business away from a fastener supplier who has engineering cost, and give it to someone with no such cost, you're going to pay through the nose eventually.

The same holds true for assembly machines as well as other production equipment, so this sequel will probe into "the high cost of cheap equipment".

When an OEM supplier is asked to design and build a special assembly machine, he must spend a lot of engineering time and effort to come up with a machine that will do the intended job. Then to prove out this tooling, he will usually set up the machine in his own shop to assemble a considerable quantity of his customer's products. Finally the machine is proved out and delivered. The builder may get only his cost out of the first such machine, hoping that re-orders will bring the deserved remuneration.

But some buyers have extra sharp pencils and figure that once a prototype machine has been developed, they can go to a local machine shop to get a similar machine at a fraction of the cost.

One such case we know about involves a rather expensive multi-station machine for bonding small parts. After the prototype was placed in operation, the customer found that he could use more such machines. So he ordered one from a local shop. No end of trouble ensued because the equipment just wouldn't sequence properly. Finally the OEM supplier was called back and asked to put this bargain equipment in working condition. The expense involved was terrific.

We know of another company which had a machinery firm develop an assembly machine for small parts. Even though it was not a particularly expensive item, the customer decided to go to a small machine shop for a second machine. This shop had no experience in the assembly machine field, but did manage to deliver a similar machine. It never did work properly, and again the buyer had to ask the OEM supplier to come to the rescue.

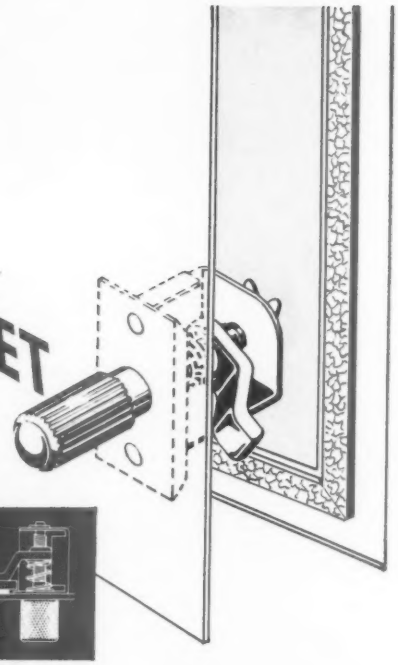
You may think these are isolated cases, but just take a second look at some of your own production equipment. How many "bargains" can you find that are causing you grief? They may as well be junked as the cost of putting them in working order could be more than the original price tag.

There is no substitute for OEM engineering know-how. If you don't pay for it at the outset, you must pay for it somewhere along the line.

Matt E. Hensley

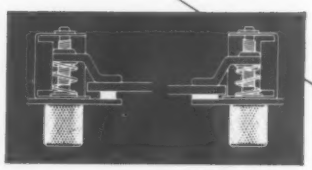
Managing Editor

FOR A TIGHT CLOSURE
OR TO COMPRESS A GASKET

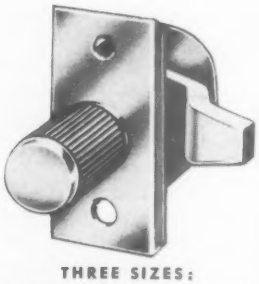


SOUTHCO

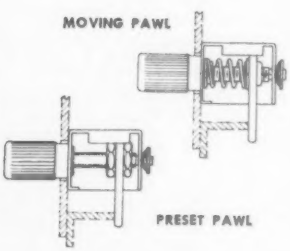
Adjustable Pawl
FASTENERS



¼ turn closes—additional turning tightens



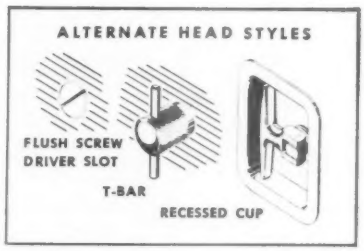
THREE SIZES:
MIDGET • INTERMEDIATE • LARGE



Just slip the knob through a hole in the door (any door thickness—it doesn't matter). Fasten with two rivets, bolts, or welds. The Southco Adjustable Pawl Fastener will fit your door frame, even when material gauge varies between units.

Turn the knob. The first quarter turn latches the door. Now keep turning. You're pulling the door tightly against its frame. You can compress a gasket, form a dust or moisture seal, overcome vibration.

You'll save installation time and satisfy your customers with these rugged, attractive, pre-assembled fasteners. Ideal for heavy machines, electronic consoles, miniaturized units, cabinets, missiles, slide-mounted modules, etc.



FREE!
FASTENER
HANDBOOK

Send for your free copy of Southco Fastener Handbook. Gives engineering data on many fasteners. Write to Southco Division, South Chester Corporation, 257 Industrial Highway, Lester, Pa.

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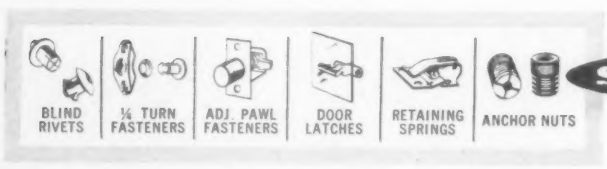

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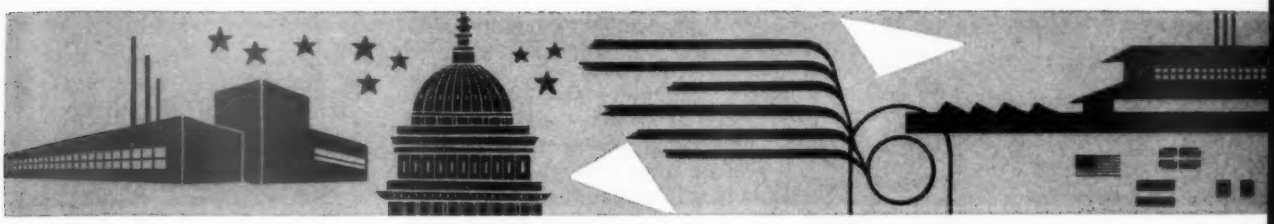
The State of Business



AUTOS—BEST YEAR SINCE 1955!

by **L. L. Colbert,** president
Chrysler Corporation

Clear signs indicate that the automobile market will be even better in 1960 than it was in 1959. We at Chrysler Corporation believe that retail sales, including imports, will reach and probably exceed 7 million units. This would make it a year second only to 1955 when 7,200,000 cars were retailed.

The steel strike pushed a substantial volume of automobile production over into 1960. Thousands of sales that would have been made during the fourth quarter were postponed, causing manufacturers to raise their 1960 production schedules.

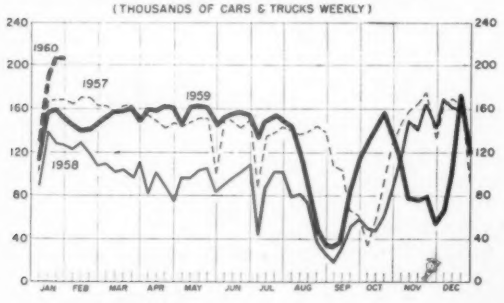
The automobile industry originally planned to produce about 2,240,000 cars during the first quarter of 1960. Although production did not reach this goal, it will probably continue at high levels throughout 1960—in part to keep pace with sales and in part to replenish new-car inventories depleted as the result of steel shortages.

There are many other reasons for the excellent automobile market in 1960. Here are a few:

1. The new compact cars introduced last fall—which have provided motorists with an "economy option"—have stimulated the entire market. There has been greater interest in new automobiles of all price classes than the industry has seen in any new-model introduction period since the fall of 1954. Dealers have reported heavy showroom traffic, and many say it is the heaviest they have ever seen. We expect to increase production from the present 4400 to 7500 Valiants by the end of April.

MOTOR VEHICLE PRODUCTION

(THOUSANDS OF CARS & TRUCKS WEEKLY)



Source: Ward's Automotive Reports
Prepared by THE NORTHERN TRUST COMPANY - Chicago

LESTER L. COLBERT

President
Chrysler Corporation

Colbert, a 55-year old Texan, joined Chrysler in 1933 as a resident attorney. He moved up through the Dodge division (president in 1950) and was tapped for the top spot in Chrysler in November 1950.

2. General business conditions are promising. The gross national product is running close to the half-trillion dollar level. Personal income is high and rising. Individual savings at the midpoint of 1959 were more than three times the amount of debt, including the mortgages on homes. Consumers are in a position to buy durable goods.

3. Consumer confidence is high. It remained high even through the steel strike. And if further interruptions in production can be avoided and business conditions remain favorable, consumers will have an increasing inclination and ability to buy. Economists are predicting that consumer spending will push total 1960 sales of goods and services to new records.

4. The demand for good used cars continues to be strong and steady, and used-car prices are firm. This is an important stimulant to new-car sales, because a healthy used-car market keeps trade-in allowances high.

Retail sales of new passenger cars in the United States in 1959 exceeded 6,000,000 units including

continued

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+
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highest quality
=greater reliability

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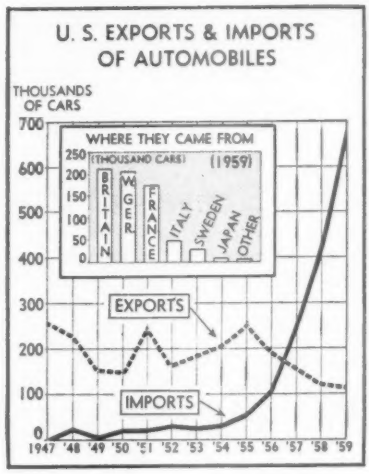
600,000 imports. This gave 1959 an increase of approximately 1,400,000 new-car sales over 1958 and makes it the industry's third best year.

We in the industry expect increasing demand throughout the Sixties. We are entering a decade when the base of automotive demand is going to be well above that of the 1950's. The population of the United States is now 28 million greater than it was ten years ago, and the number of households has increased from 42 million to 51 million. The population will continue to increase by more than 3 million a year, so that by 1965 it will probably be close to 200 million, over 20 million more than at present, and the number of households will have increased by 4 to 6 million. The age group 15 to 24 will rise 25%.

With about 58 million cars now in use, as compared with 36 million ten years ago, the annual scrappage rate has also increased in the same period from 2½ million to well over 4 million. By 1965 we expect that the number of cars in use will range between 66 and 69 million, and that the scrappage rate will probably reach 5 to 5½ million.



The growing population continues to spread into the suburbs; and suburban dwellers must depend on their cars, since a great majority of the outlying communities make no provision for public transportation. Multiple-car homes (jumped from 4 to 7 million between 1954-1959) will continue to increase. At the same time, people are tending to regard the auto as a personalized and highly specialized means of transportation. People are looking for specific cars to best fit their needs, such as station wagons and compacts. •

NEWS ON THE 1960 AUTO MART

• Production cuts beginning in late January were ordered when sales began to lag, piling up dealer inventories estimated in March at one million autos, an all-time record. Sales contests were mobilized at Chevrolet, Dodge, Plymouth, Oldsmobile, Imperial and Pontiac to keep stock moving until the usual spring pickup.

• First quarter production of nearly 1,900,000 cars was second only to 1955's 2,100,000 output.

• One analysis suggests that the "cloudy" picture is due to an upheaval in the market which is not affecting all companies alike. The big market for economy cars is still not large enough to sustain the ambitious production planned by industry.

• January retail sales totaled 455,272 for a 10.7% gain over January 1959. Sales fell short of production by 230,000. Two month sales were 940,000.

• Through February, production showed the usual leaders—Chevrolet, Ford and Plymouth—in the 1, 2, 3 slots. Of Chevy's 380,000-odd cars, almost 65,000 were Corvairs. Ford's standard models were trailing last year's figures, with Falcon accounting for 85,000 of 325,000 cars turned out. Plymouth's 113,000 included 40,000 Valiants. Rambler, Oldsmobile and Pontiac were bunched at 83,000 followed by Dodge with 70,000, Buick, Mercury, Cadillac and Studebaker-Packard.

• Bendix Aviation's president Malcolm P. Ferguson predicted a domestic output of 6,250,000 units in 1960 at the company's annual meeting. This, incidentally, is the same figure set by Paul E. Herzog, director of research, National Automobile Dealers Association in Nov. 1959 for domestic sales in 1960. Herzog foresaw imports at 500,000. The Commerce Department looked for production of 6,700,000 units.

• Early figures indicate that the compacts are not cutting into imports as much as into the sales of standard American models. Compacts rose from 7.3% during the first six weeks of introduction last year to 20.4% this year. Imports dropped from 8.9% to 8.8% and standard makes dropped from 83.8% to 70.8%.

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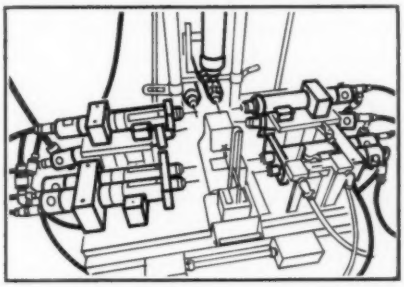
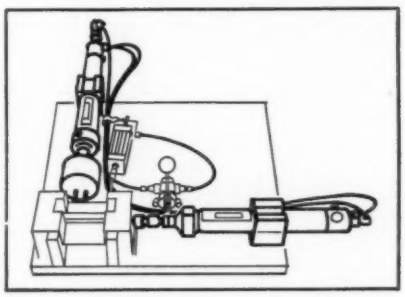
DRILL 3,000 per hour

Set up any number of Aro Self-Feed Drills in single fixture, then drill up to 3,000 holes per hour automatically. Capacities from $\frac{1}{16}$" to $\frac{1}{2}$" . . . speeds from 500 to 20,000 rpm . . . stroke lengths from $\frac{3}{8}$" to 6". Use any combination of types and speeds, mount drills in any position.



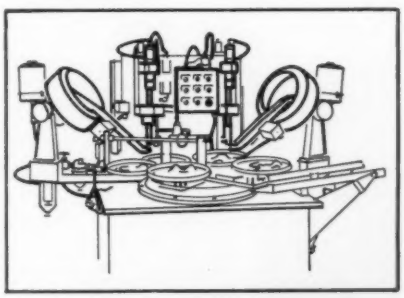
TAP 2,400 per hour

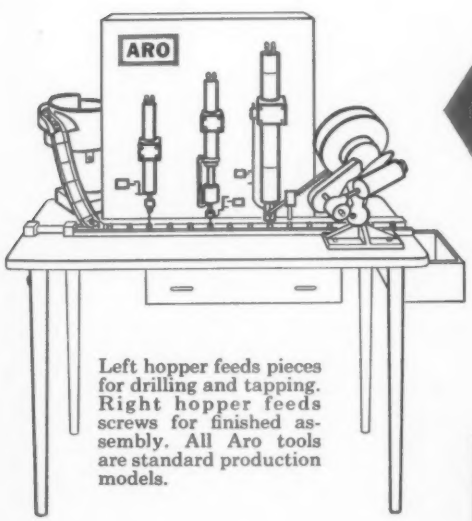
Combine your drilling and tapping operations in one fixture and eliminate costly handling. Aro Self-Feed Tappers have capacities up to $\frac{1}{4}$"-20 in mild steel, or larger holes in softer materials. Speeds of 500, 900, 1,450 and 2,700 rpm. Stroke lengths up to $1\frac{1}{2}$". Accessories for precision depth.



FASTEN 3,000 per hour

Go automatic on your threaded-fastener operations with Aro Self-Feed Screwdrivers-Nutsetters. Standard range of speeds for the most commonly specified screw sizes. Uniform torque settings held within close limits. All models available with precision ball-type clutch.





Left hopper feeds pieces for drilling and tapping. Right hopper feeds screws for finished assembly. All Aro tools are standard production models.

see ARO self-feed air tools *IN ACTION*— drill, tap, fasten!

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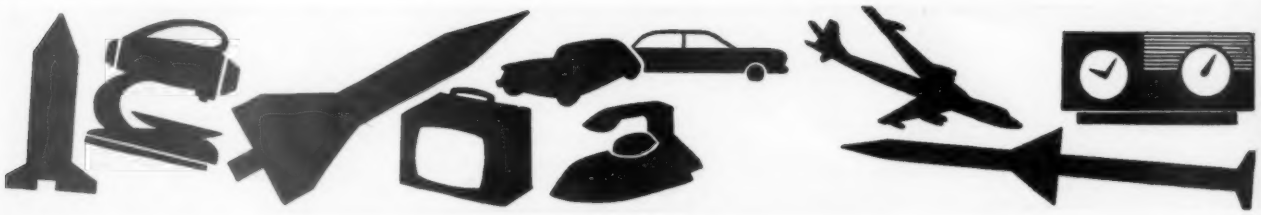
Industry at Work



RESEARCH CAMERA STRETCHES EVENT OF ONE SECOND INTO 28-HOUR-LONG MOVIE

A wire explodes when 50,000 volts are applied. The entire process lasts only few microseconds and was never before visible.

A movie camera that can stretch the events of one second into 28 hours is now in production. By combining optical, electronic and mechanical principles, the new ultra speed camera can take from 480 to 1,600,000 pictures per second on standard 35mm film, in black and white or color.

The new camera was developed by Dr. Albert T. Ellis, associate professor of applied mechanics at the California Institute of Technology. He originally designed the basic instrument for the express purpose of photographing gas bubbles appearing in turbulent fluids. Such bubbles are born and die within a few thousandths of a second, but during their short life span they produce cavitation, a highly destructive effect in hydrodynamics.

The improved commercial model, built by the Benson-Lehner Corporation of Santa Monica, represents the latest research instrument for magnification of time. It permits scientists and engineers to freeze motion while studying arc discharges, explosive reactions, fragmentation processes, high frequency fatigue and many other ultra-fast events.

Since no mechanical shutter can approach this speed, an electro-optical shutter is used which controls passage of light by means of ultra rapid electric pulses. The shutter assembly consists essentially of two polaroid filters and a cell filled with a special substance in an electric field. When the field is off, no light passes through the assembly. When a high energy electric pulse is applied, the light is polarized in such a manner that it passes freely through the filters. One or two optical lenses focus the image onto a rotating mirror in the film box.

The film remains stationary while the mirror revolves at the rate of 100,000 rpm. The rotating mirror is a piece of nickel-plated aluminum shaped like a wedge and attached to the staff of a high speed, air driven turbine. Placed at the center of

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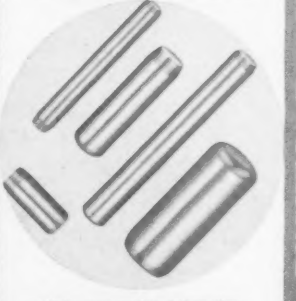

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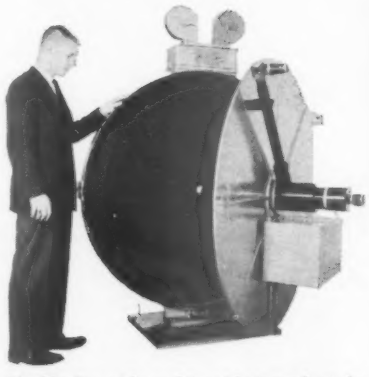
the circular film box, the mirror directs the light rays to the film so that the image travels along the inside rim of the circular film box.

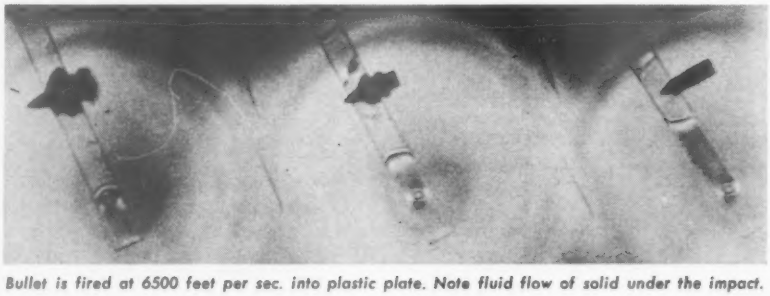
The speed of operation of the electro-optical shutter is determined by the speed at which the electric field is applied and removed. For the rates required in this camera, a very short pulse of 18,000 volts and 20 amps is used to control the field. The special pulser system designed for this camera permits effective exposure times of .05 to 1.0 microseconds.

The camera is equipped with its own lighting system, capable of producing 400,000,000 lumens with three milliseconds duration (about 60 times more than the most powerful flash bulb). Its film magazine can handle 400 feet of film, is push-button controlled and allows automatic replenishment of the main camera chamber without set-up changes.

When operated at its lower speeds, it will also stop motion in mechanisms such as cams, relays, springs, breaker points and so forth, permitting visual study of stresses, patterns of vibration and eventual failures. Besides its obvious scientific importance, ultra speed photography will also bring improvements in mechanical design not possible by any other methods.



The film lies with emulsion side inwards at the periphery of a circular shaped film box. The film remains stationary while a rotating mirror conveys the image from frame to frame.



Bullet is fired at 6500 feet per sec. into plastic plate. Note fluid flow of solid under the impact.

BUZZER WARNS WHEN CAR TOO CLOSE TO PAVEMENT EDGE

A warning buzzer to notify motorists when their cars are too close to the pavement edge was demonstrated in Washington, D.C. recently before the Highway Research Board.

Developed by Electronics-Instrumentation Department, General Motors Research Laboratories, the product is analogous to the "beam" by which aircraft pilots maintain course from one airport to another.

Albert F. Welch, head of Electronics-Instrumentation, said the Electro Lane is a simple low frequency (2 kilocycle) electromagnetic device that could be installed easily in or beside any paved road at relatively low cost. The road system could be powered either by 12-volt batteries or an alternating current power line. It works this way:

Wires parallel either side of the pavement or in the divider strip, creating, in effect, an electrical fence. Cars are equipped with ferrite core pickup coils hanging from either side of the front bumpers. Whenever a car drifts toward the pavement edge or center strip, one of the pickup coils comes within two to three feet of the buried wire loop activating a buzzer on the car's instrument panel. •

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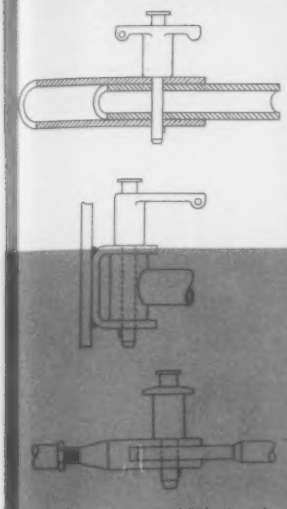

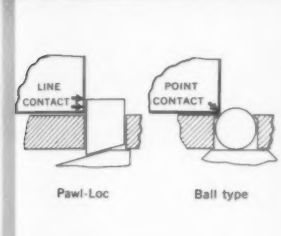

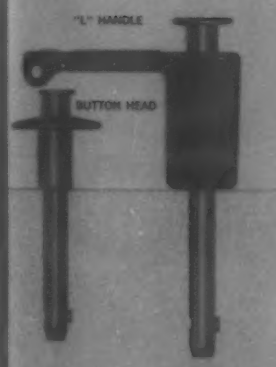

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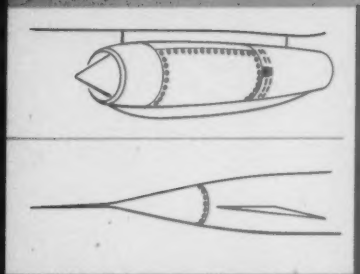

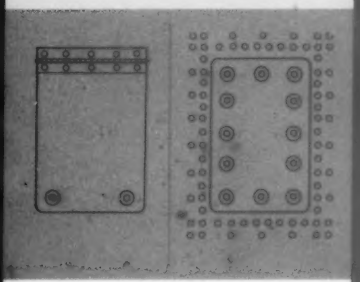

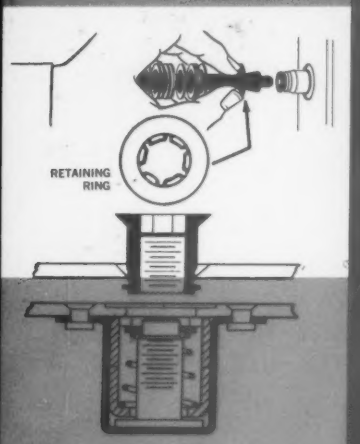

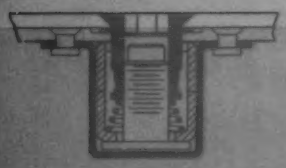

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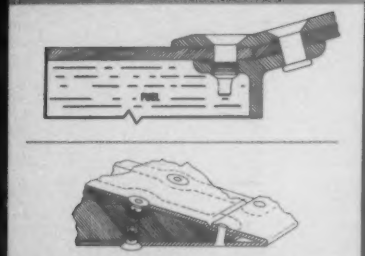

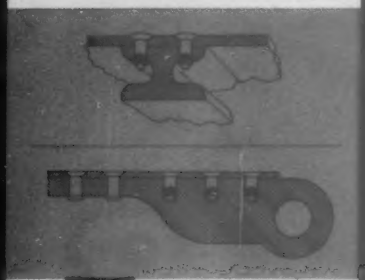

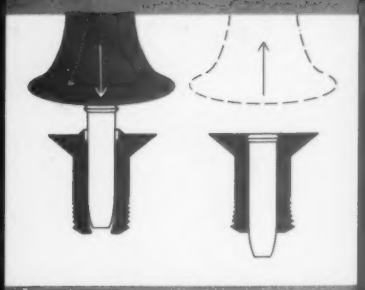

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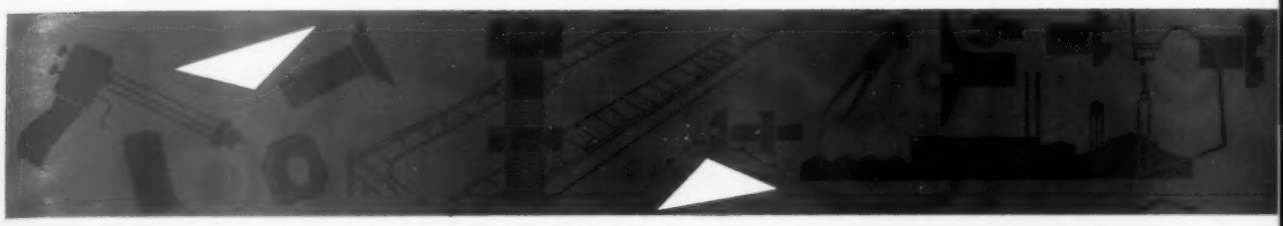
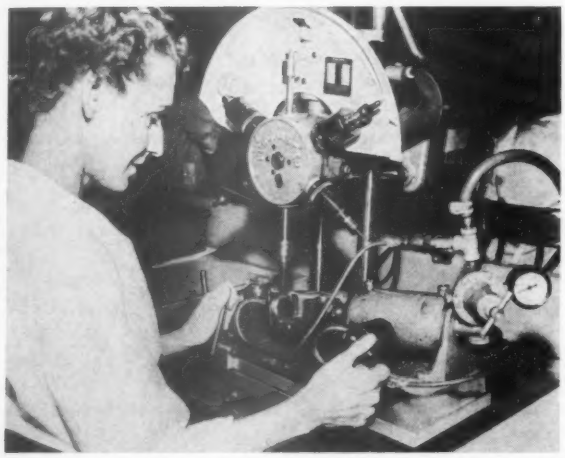
Assembly and Fastening Ideas





At operator command a six-spindle turret indexes to drill, tap and fasten together an electronic part.

ONE DRILL SETUP MACHINES, ASSEMBLES

An electronic instrument manufacturer assembles, drills, taps and fastens a dial potentiometer in a single setup using a drilling machine. This saves time over previous methods, eliminates extra handling and produces consistently accurate assemblies.

The Burgmaster's six-spindle turret is double tooled to perform three operations twice each rotation of the turret. This avoids loss of time which would result from indexing idle spindles.

An air cylinder-operated fixture first presses a dial and knob together, then holds the assembly for the remaining operations. Tapmatic heads tap the drilled holes and also chuck the hex wrenches used to drive in a socket set screw which secures the assembly. The heads are provided with a torque adjustment to suit the tap size and material to avoid breakage. The hex wrench heads are also preadjusted to supply torque to precise tension.

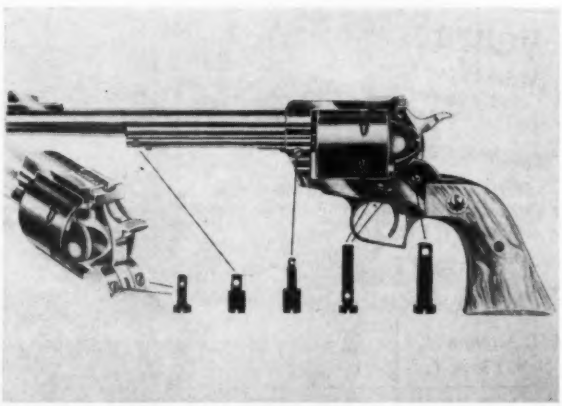
LOCK SCREWS LICK VIBRATION PROBLEM

When would a single action revolver ever be fired 3600 times an hour for nine consecutive hours? Yet this is the extreme test Sturm, Ruger & Co., Inc. went to before specifying a self-locking fastener as standard on all Ruger handguns.

Ordinarily, machine screws would have long since loosened under the cocking and jarring blows of the hammer. This industry-wide problem often resulted in the loss of working parts and resultant customer complaints.

The screw which remained tight under 32,400 firings relies on a tough nylon pellet permanently imbedded in the thread. Projecting slightly beyond the crest of the thread, the pellet is compressed when the mating parts are engaged. It then sets up

continued



Self-locking fasteners are now standard in seven locations on the .357 and .44 caliber Rugers.

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Reference For
Threaded & Headed Products!

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1960 EDITION

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METAL FASTENERS
CATALOG

For more than 25 years Atlas Screw & Specialty Co., Inc. has been synonymous with quality and service. In keeping with our desire to serve you best, we have just completed printing our newest catalog. The list prices published therein are up to date and reflect the most current changes.

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3661 N.W. 48 St. Miami, Florida	250 Mill St. Waterbury, Conn.

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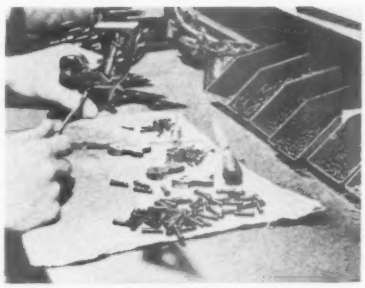
a counter-force and creates a strong metal-to-metal engagement of the threads opposite the pellet. The fasteners can be removed and reused with no loss of locking torque.

Also eliminated is the practice of applying varnish to screws to hold them in place.

Ruger is so enthusiastic about Nylok fasteners that it is offering bags of the screws to present and past Ruger gun owners at cost.



Self-locking screws proved their ability to resist vibration in holding the revolver's working parts in place.

CLAMPS HOLD PROTECTIVE SEAL AS JET ENGINE IS ASSEMBLED

Stainless steel clamps are teaming with a special vinyl disc to seal out dirt and humidity during final assembly work on the DC-8 Jetliner engine.

From the time the engine is received from the manufacturer until it is mounted, extensive installation of electrical, hydraulic and pneumatic systems is done.

Sealing was a critical problem until Nay Engineering Corp., Pasadena, came up with B. F. Goodrich's Geon vinyl as the base material in erecting a barrier in front of the inlet guide vane case. The disc protects finished portions of the engine but allows technicians access to the cowl and nose bullet.

Clamps on the inner and outer diameters lock the barrier in position. The inner clamp is under tension, the outer under compression.

QUICK-SETTING ADHESIVE BONDS PLASTIC TO ALUMINUM

Substitution of a quick-setting adhesive in place of more conventional mounting methods is helping Electronic Associates, Inc., of Long Branch, N.J., achieve greater miniaturization of electronic equipment. One application involves the mounting of electrical relays to potentiometers using an adhesive. The relay cases are made of irodite-finished aluminum, and the potentiometer covers of phenolic plastic. One drop of the liquid cyanoacrylate monomer makes an almost instant bond between the two dissimilar materials.

This compact team of components is placed in a digital attenuator system (called a DAS) which becomes part of an analog computer. Engineers decided to attach each relay to its associated potentiometer and mount them as a single unit. In so doing they eliminated the need for relay mounting brackets and decreased the amount of wiring necessary. They settled on Eastman 910

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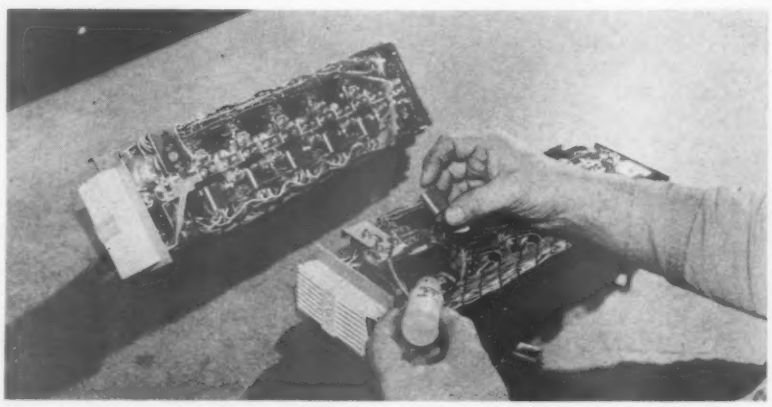

Contact pressure bonds aluminum electrical relays to plastic potentiometers.

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Speed production, multiply profit on any assembly of two to twenty-two nuts or screws. Thor multiples are custom engineered to your exact assembly situation. All fasteners are secured simultaneously to identical torque. Thor multiples can be engineered for any pattern, any product. Thor multiples are now in use in the assembly of such widely diversified products as floor mops and carburetors. Write today for Thor's complete automation manual on multiple fastener settings.

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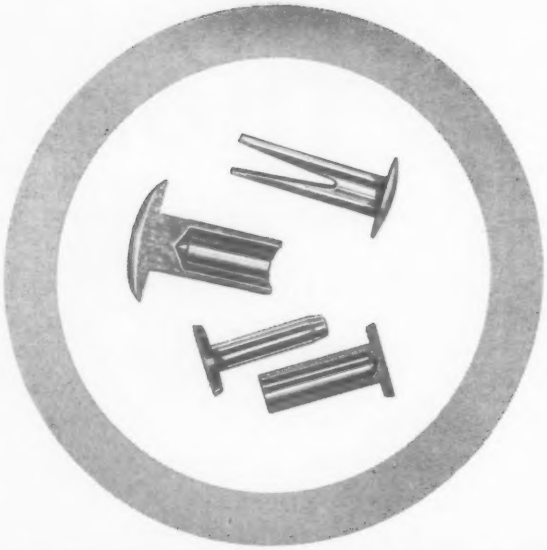

COST-CUTTING PRODUCTION TEAM!

. . . the two-way answer to assembly problems

Here's a combination that cuts production costs and gets rid of assembly problems in a hurry—Milford Tubular Rivets made to high quality standards to assure a better finished product for you . . . Milford automatic rivet-setting machines that can be quickly adapted to your particular fastening needs.

Milford's MANUAL OF MODERN RIVETING PRACTICE may have the answers to your riveting problems. Ask a Milford Representative to show you how to use this manual to cut production costs.

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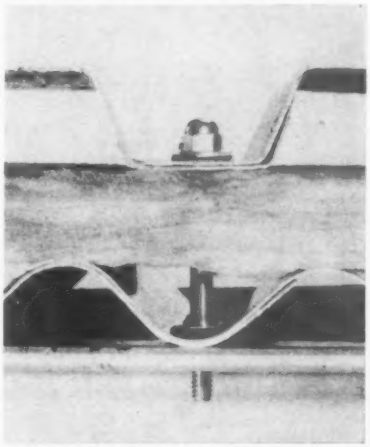
adhesive because "it sets quickly, resists vibration well, is clean."

TAPPING FASTENER SPEEDS CURTAIN WALL ERECTION



A toothpick is to a sandwich what a stainless steel fastener is to a "sandwich" wall.

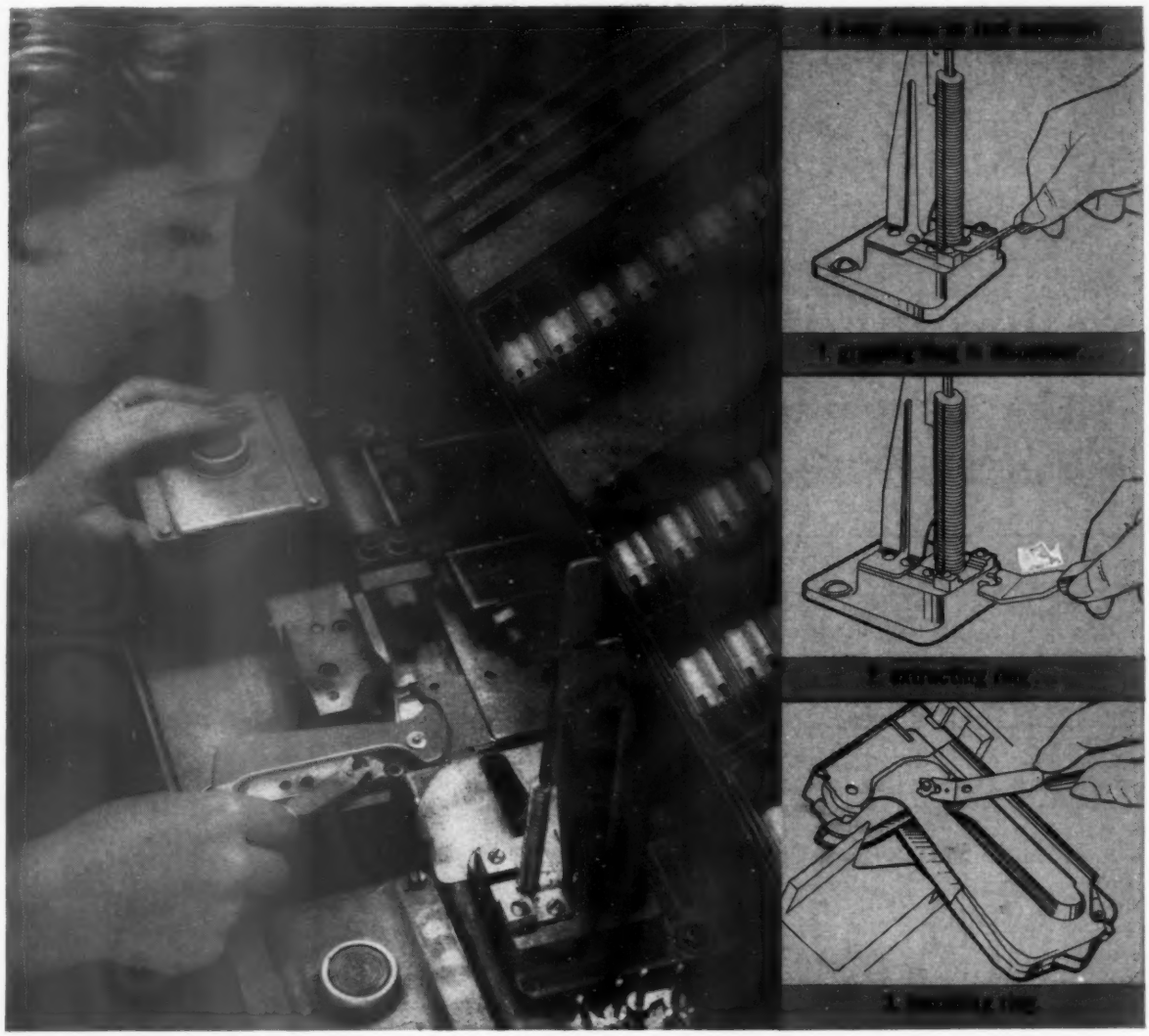
No pointless equation, this simply describes the importance of a relatively new architectural fastener that permits a lower cost, speedier erection of curtain wall sections.

Fabricated Products Company, West Newton, Pa., reports that their self-tapping screw fastener reduces the field installation time of curtain walls.

The three parts required in conventional curtain wall fastening are: a bolt, nut and washer combination to fasten the interior sheet to the framing; a spacer bar to hold the insulation, and an additional fastener to secure the exterior sheet to the inside sheet. The CW Topseal fastener combines these three jobs in one.

The threaded screw section of the fastener is cold headed by Lamson & Sessions Company, from Allegheny Ludlum stainless steel wire. Lamson & Sessions gives the metal a cold reduction temper pass which raises its tensile strength to 90,000 psi.

The fasteners work in combination with any materials currently being used in curtain wall construction, including stainless or galvanized sheet or aluminum sheets. Cadmium plating acts as a lubricant during assembly. •



Truarc rings and dispenser speed staple gun assembly 60%

This big production increase was made by Swingline, Inc., Long Island City, N. Y. in assembling the handle lock of their high-compression staple gun.

To speed production, the Truarc Prong-Lock® Series 5139 retaining rings come *pre-stacked* for use on the Truarc *dispenser* (shown in foreground of photo above). Application is simple, fast and requires no skill. The operator, using the Truarc *applicator*, grasps the bottom ring, removes it from the stack, and installs it, quickly and easily, in the staple gun assembly.

The Truarc ring replaced an ordinary flat "C" washer, previously used in this application. *While the unit cost of the washer was lower than that of the Truarc retaining ring, the use of the rings resulted in assembled cost savings of $25.00 per thousand staple guns.* The reasons: a 60% increase in production due to faster, easier assembly with Truarc tools, and the elimination of time-consuming, costly adjustments made possible by Truarc rings. What's more, the bowed Prong-Lock ring improved product design by providing resilient end-play take-up . . . eliminating looseness or binding in the parts.

Truarc retaining rings come in 50 functionally different types . . . as many as 97 different sizes within a type . . . 6 metal specifications and 13 finishes. Truarc assembly tools, pliers, applicators, dispensers and grooving tools are available to speed production of virtually every kind of product. Make sure you have on file the new 16-page Waldes Truarc Assembly Tool Catalog No. AT 10-58. Write for your copy today. And remember Waldes engineers are always ready to help you solve your special application problems. Waldes Kohinoor Inc., 47-16 Austel Place, Long Island City 1, N. Y.

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Waldes Kohinoor Inc., Long Island City 1, N. Y.

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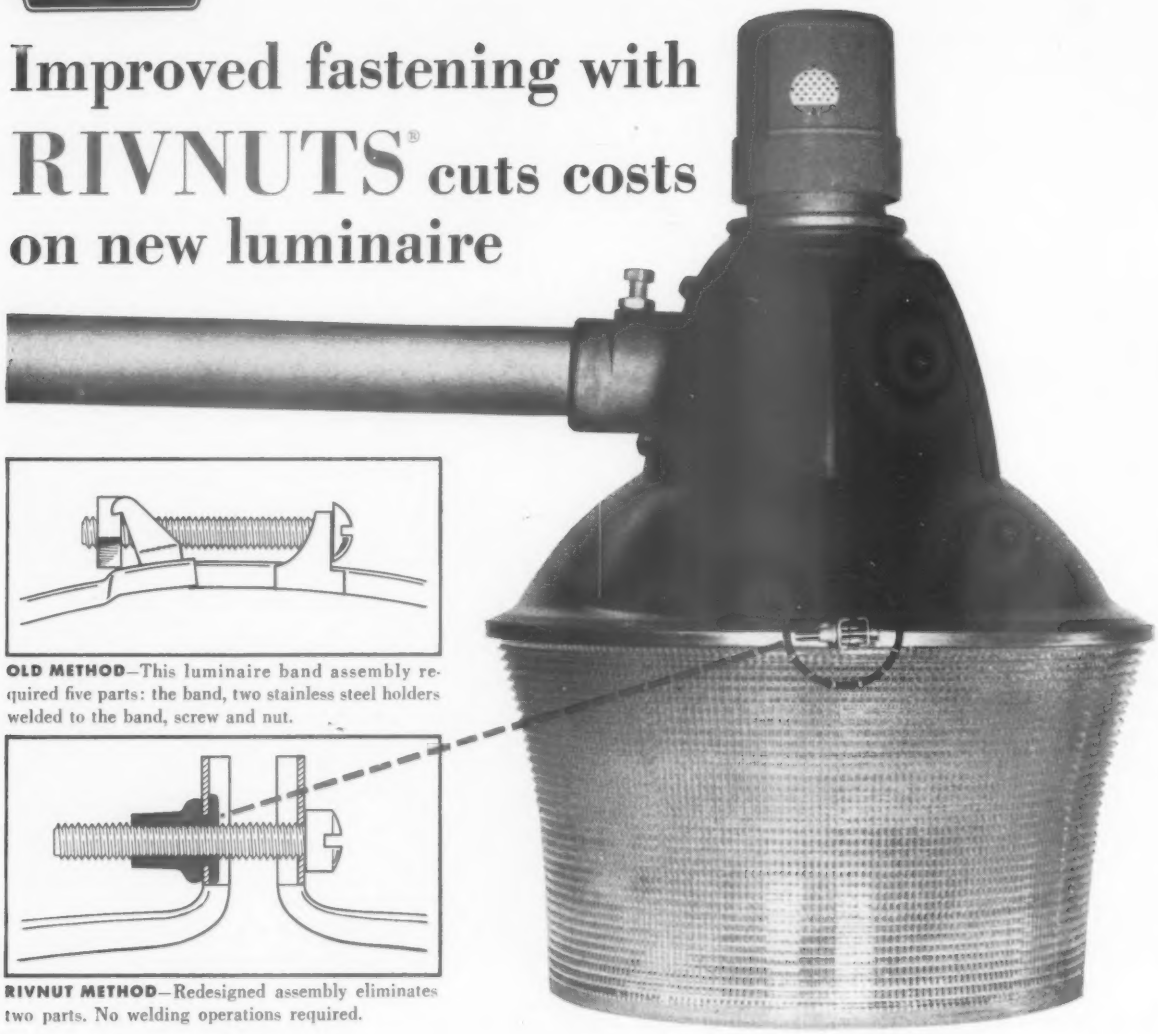
B.F.Goodrich

Improved fastening with RIVNUTS® cuts costs on new luminaire

OLD METHOD—This luminaire band assembly required five parts: the band, two stainless steel holders welded to the band, screw and nut.

RIVNUT METHOD—Redesigned assembly eliminates two parts. No welding operations required.



The manufacturer of this outdoor lighting luminaire, Line Material Industries, McGraw-Edison Company, reports "considerable cost savings" since redesigning the luminaire holding band for RIVNUT fastening.

Five separate spot welds were eliminated, along with two parts. The RIVNUT is strong and secure. And unlike the old method, there's no loose nut to be dropped.

RIVNUTS are the only one-piece blind rivets with internal threads. They can be installed by one person, from one side of the work, in a few seconds with a heading tool. If you'd like recommendations on a specific fastening problem, please send a print of your part.

You can improve fastening in sheet metal, tubing, tanks with RIVNUTS

New data booklet describes principle, typical applications of RIVNUTS, lists size and tool data. For free copy write Dept. AE-4. *B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Akron, Ohio.*

B.F.Goodrich *Rivnuts*

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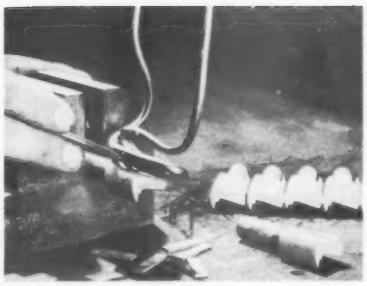
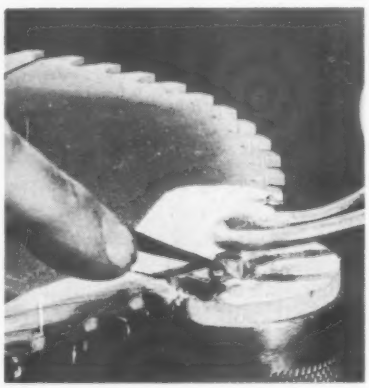


Carbide tips are brazed to a router bit (top) and saw tooth (bottom).



ELECTRONIC INDUCTION HEATING SPEEDS TOOL TIP BRAZING

Problems of reworking brazed carbide tips on router bits and saw teeth for woodworking tools have been eliminated by the Virginia Machine Tool Co., Bassett, Va., with use of an electronic induction heater.

With the use of a variable coupling output transformer, the company was able to match the heater to the output coil, instead of designing and forming an output coil to meet the fixed outputs of the heater.

In the past, carbide tips were manually brazed to bits or saw teeth through heat from a small oxyacetylene torch fitted with different-sized nozzles. A uniform brazing temperature over the area to be worked was almost impossible to achieve, so production quality was uneven, and different coefficients of expansion in the steel and the carbide resulted in stress and eventual cracking of the carbide tips.

"Our product quality has been greatly improved," said V. G. Bryson, manager. "We tip about 225 saws per month (averaging 65 teeth each), approximately 200 router bits per year, and any other cutting tool we manufacture.

"With the oxyacetylene torch, the brazing of carbide tips to circular saw teeth was a hand operation. Each tooth was soldered separately, after which the teeth were fluxed, and each carbide tip applied. The tip would be placed against the tooth and heated to 1100°F. This temperature was held for about 30 seconds before removing torch. This was the fastest possible production speed, as accomplished by a skilled craftsman of the highest order.

EPOXY ADHESIVE BONDS CORE, KEEPS TRANSFORMERS QUIET

Two by-product advantages claimed for adhesive-bonding are vibration resistance and a damping action, in addition to actual joining. These factors are particularly advantageous in the manufacture of electrical transformers.

All electrical transformers hum. Normally, the sound is not unpleasant. But noise from some transformers—particularly laminated core types—often reaches objectionable levels.

Since the sound comes from vibrations on the core set up by the coils' magnetic field, design engineers know it cannot be elimi-

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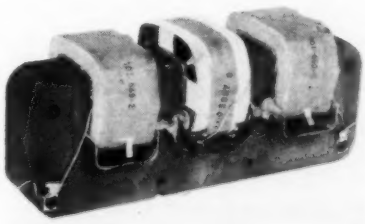


nated. Instead, they concentrated on finding ways to damp the noise.

Engineers at Jefferson Electric Co., Bellwood, Ill., now feel they have found the answer to the hysteresis hum problem in producing laminated core transformers.

By bonding the laminations together so they are forced to vibrate as a unit, Jefferson engineers can quiet vibration noise. To do this effectively, they needed an adhesive that had high metal-to-metal adhesion, good dielectric characteristics, was non-hygroscopic, non-toxic and had high viscosity.

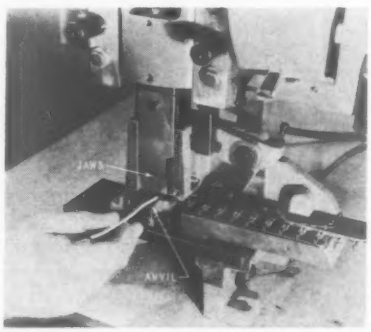
Lab tests showed that epoxy compounds, as a group, met most requirements. But solvent evaporating types were unsuitable because they have poor dimensional stability. They also tend to leave voids when the solvent evaporates.

Bondmaster M620, the adhesive selected, is a one-part, no-mix 100% solids epoxy, manufactured by Rubber & Asbestos Corp. Since it is solvent-free, there is no waiting time before mating sections to be joined. Equally important from Jefferson's viewpoint: Its curing cycle parallels the drying cycle required in transformer manufacture. That saves time since both can be done simultaneously.

FORCE GAGE TESTS CRIMPED TERMINAL TENSILE STRENGTH

Tensile strength requirements for solderless electric connections vary widely from one application to the next, depending on the type and size of wire, its insulation and the depth of the joining crimp.

Malco Mfg. Co., Chicago, makes solderless terminals on its own Malcomatic electric crimping machine. To meet varying wire sizes, the depth of the crimping jaw or the radius of the grooved anvil must be adjusted, determining the terminal tensile strength. Customer specifications must be met.



Terminals are fed in continuous strips from mounted spools. The machine makes the crimp and cuts the strip in one operation.

The problem is to know not only when the tensile strength of the crimp meets specs but also to convince the customer that it does. There have been neither test standards nor standard instruments for making these tests.

Misunderstandings have been all but eliminated with the development of the special Hunter terminal pull tester. This force gage is accurate to plus or minus .25 lb. at full scale reading and has a special turret head notched to accept a variety of wire sizes.

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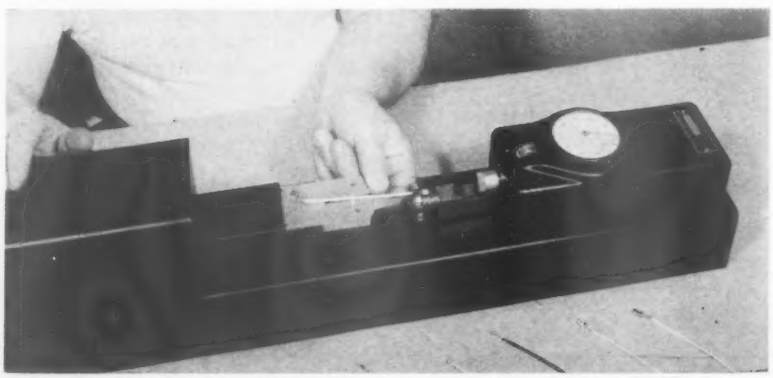

Crimped joints on terminals are tested for tensile strength. The special force gage has a 50 lb. capacity.

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Do you have a fastener problem? TRIM-CLIPS have been widely known and used in the automotive, radio, stove, refrigeration and aircraft industries most extensively for attaching trim panels and mouldings to the structure.

Find out for yourself the many applications of TRIMCLIPS . . . by presenting us with your problem. Send sample section, if possible, otherwise full description and details.

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NEW TENZ-NUT®

preassembled for fast production . . .

Now — a spring washer preassembled on a hex nut — to save time in all types of assembly operations where the tested principle of bolt, nut and spring washer are required. Developed by Eaton-Reliance, this new fastener is now available for production use.

The spring washer — a modified Belleville, or "cupped" type — is firmly attached to the hex nut, yet it spins freely during application and removal. Tenz-Nuts are reusable.

The proven locking principle of the cupped-type washer, when combined with a hex nut, gives you a versatile fastener for automatic assembly operations. It is particularly applicable where finished parts are being assembled and it is desirable to minimize surface marring. Tenz-Nuts may also be adapted as sealing nuts.

Write for our new Engineering Bulletin which fully describes Tenz-Nuts.

Eaton also offers a complete line of Keps®— hex nuts preassembled with tooth-type washers. Our fastener engineers will gladly consult with you on possible applications on request.

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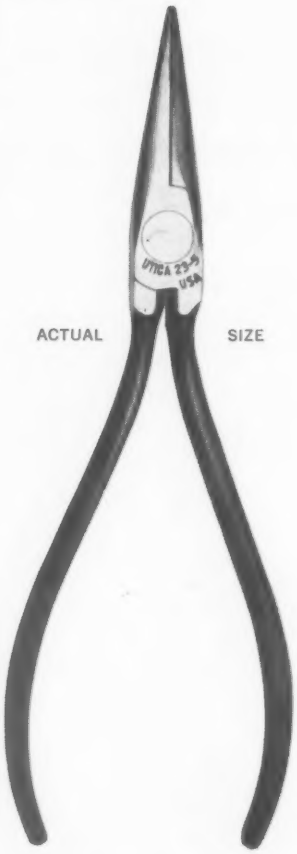

ACTUAL SIZE

NEW MIDGET CHAIN NOSE!

Specially designed for delicate electronic subminiature assembly, this new Utica plier is the first tool of its size and kind. Developed at the request of professionals in the electronic industry, it's a precision instrument offering the thinnest nose possible consistent with good tool design. Strong, well balanced, finely finished, it's available in 4″, 4½″ and 5″ sizes. Call your Utica distributor or write for complete information.

Utica Drop Forge & Tool Division, Kelsey-Hayes Company, Utica 4, N. Y.

tools the experts use!

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In operation, the connector is hooked in the turret notch, a button is pressed to operate the compressed air motor and a jaw-type clamp closes over the free end of the wire lead. The wire is pulled until the connection fails. An adjustable control provides the desired rate of pull.

DEVELOP AUTOMATED ROLL DRESSING FOR WELDERS

A production bugaboo and cost thief on many welding jobs may be licked for good by a new automated roll dressing method.

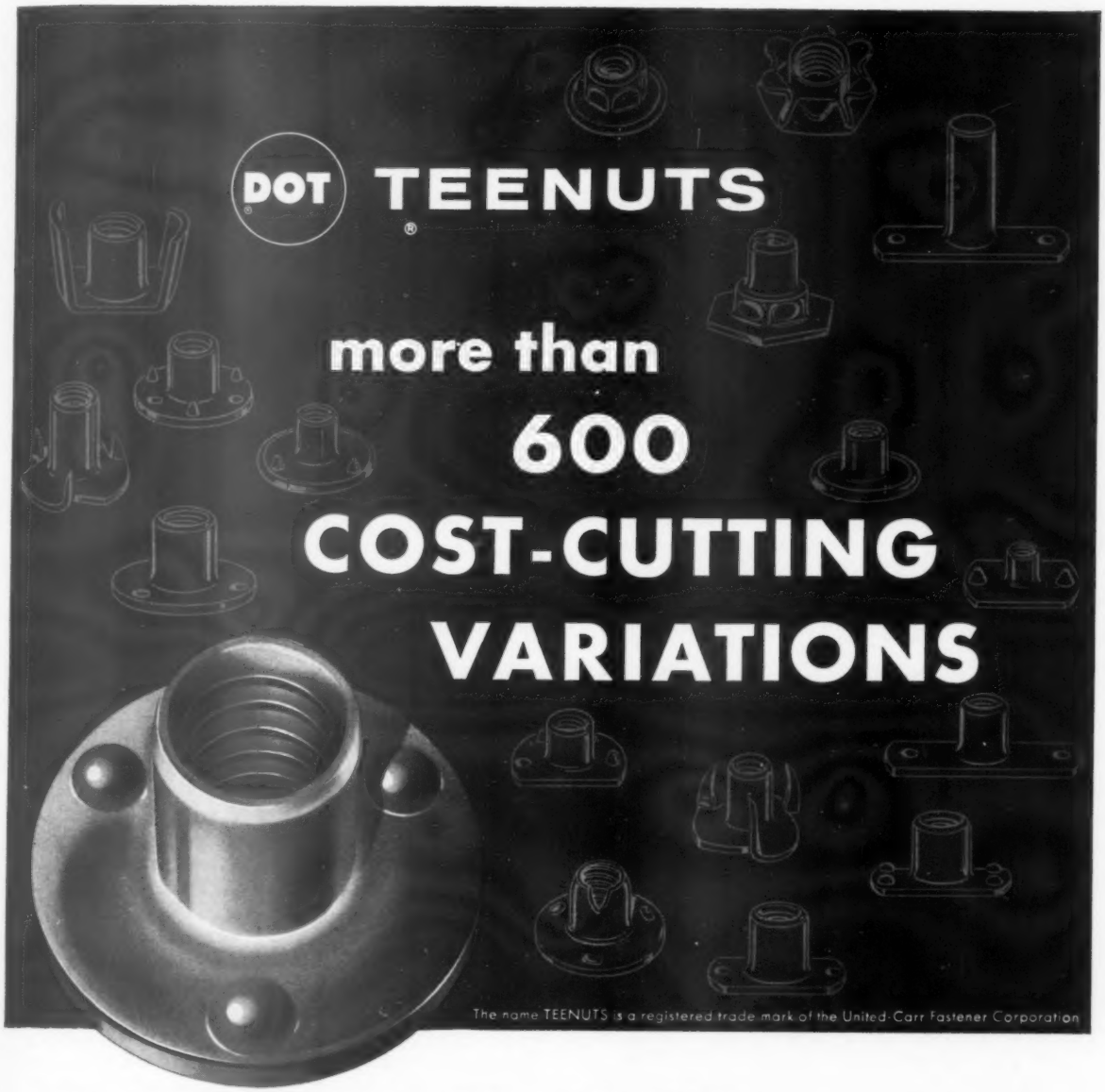
Engineers at National Electric Welding Machines Co., Bay City, Mich., report it can be used with equal success on machines assigned to jobs calling for intermittent welding or requiring periodic dressing. The system mounts on the welder itself and uses tried-and-tested lathe cutting to remove buildup.

The dressing cycle is less than 60 seconds. Frequency can be preset or initiated manually. The cut is made at a predetermined, constant, fixed depth. Thus roll life is extended and can be computed in advance. When the wheel finally must be changed, design permits replacement of the entire roll and shaft assembly in less than two minutes.

When the cycle begins, upper and lower rolls are retracted, and are held in special bearing nests, by air pressure. Radial accuracy for precision turning is provided by a special set of straddle bearings mounted on each roll. Torque is delivered through power driven gear trains to the rolls.

Mounted high speed steel tool bits automatically index for each cut. A plunge cut is followed by a number of dressing turns. Use of a contour bit maintains constant pressure and current characteristics by removing buildup on the welding face, dressing both sides of the roll and correcting "mushrooming."

After dressing, a special linkage compensates for the cut and returns the lower roll to correct welding height. •



Since the first TEENUT was developed by Carr Fastener in 1927, more than 600 different modifications of this extremely versatile device have been designed and manufactured in true, mass-production quantities.

By combining nut and washer in one solid unit, the DOT TEENUT offers exceptional strength and security and eliminates the need for tapping. Its flanged base can be formed with welding bosses for attachment to sheet or solid metal structures . . . with prongs for wood . . . or with any number of different special bases for particular applications. DOT TEENUTS can be made in heat and corrosion-resistant materials and they can be provided with moisture-seals and vibration-proof, self-locking barrels.

Once mounted, the DOT TEENUT stays put and can't be lost or mislaid . . . an advantage at any time and a necessity where blind fastening is required.

Wide experience in the proper application of DOT TEENUTS and a multitude of other special-purpose fasteners enables your DOT field representative to provide prompt and effective solutions to a tremendous variety of fastening problems. Where special design work is needed, he can bring you the services of a design-engineering group unequalled in its field.

The DOT TEENUT catalog is an invaluable reference . . . yours on request.

MAKERS OF DOT FASTENERS

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Offices In:

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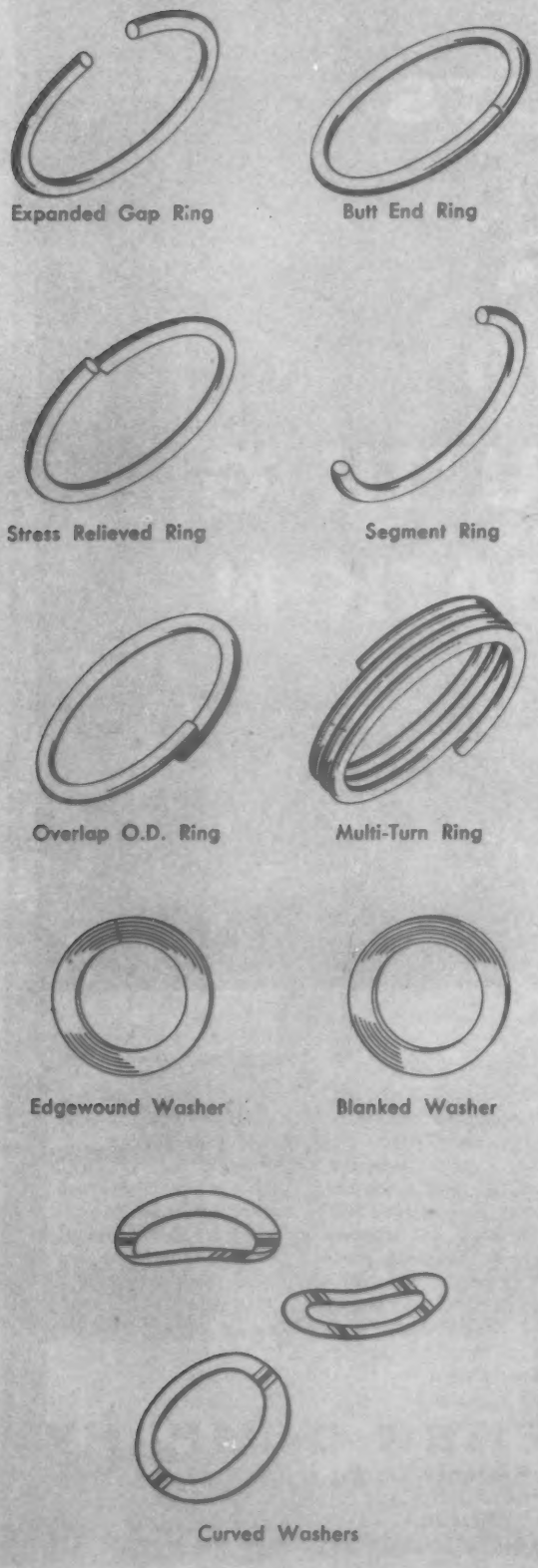
TYPES OF PREFORMS



by **Harlan Olson,** Vice President
Lucas-Milhaupt Engineering Co.

DESIGNING FOR

Silver brazing has shown itself to be a versatile tool for metal joining. It combines the following properties: strength with leak tightness; the ability to join dissimilar metals, both ferrous and non-ferrous; high electrical conductivity; and the ability to do this in a temperature range which minimizes distortion and oxidation.

All of these advantages are well documented in current literature and technical bulletins. But silver brazing is also an economical method of metal joining when the brazing alloy is placed in the joint as a preformed shape. This standardizes and minimizes costs; when combined with automatic heating techniques, it reduces the labor involved to simple assembly procedures.

In this article, we shall outline the most common joint designs and the preformed shapes which lend themselves to ease of assembly.

GENERAL DESIGN CONSIDERATIONS

Those joints best suited to withstand impact and fatigue are also those which best lend themselves to alloy preplacement. These are designs which provide either external or internal shoulders. The shoulders give positive location which eliminates elaborate fixturing. More important, they usually eliminate points of high stress concentration and place the resistance to stress in two planes.

The preform should be hidden or trapped between members. When this can be done, the alloy will flow through the joint despite any differential in heating, and will give visual assurance of joint penetration. When this cannot be done, the heating should be applied to the side of the joint opposite the preform and both members heated as evenly as possible to pull the alloy through the joint.

The low temperature brazing alloys commonly used have little alloying action with the parent metals. This permits the use of slugs, segments of rings, and other forms for ease of assembly. Capillary action will pull the alloy throughout the joint. A preform that surrounds the joint yields a more even fillet, but even the abbreviated forms will give good brazing results.

Silver brazing alloys provide minimum shear strengths of 25000 p.s.i. Joints of excessive shear

Presenting design considerations and examples of metal joints which lend themselves to use of brazing alloys in preformed shapes

SILVER BRAZING WITH PREFORMS

depths waste alloy, complicate the conduction of heat, slow production, and create oxidation problems. When excessive shear depths are inherent in the design, it is wise to put the rings near the ends of the joint and pull the alloy to the outer seams.

TYPES OF PREFORMS

Butt end ring. The common loose ring which snaps over parts or drops into holes onto an internal shoulder.

Stress relieved rings. Small rings seldom open much with heat, but larger rings that are not confined on the o.d. will distort considerably. The stress relieved ring eliminates this problem.

Overlap o.d. ring. The ring used for positive location inside of tubing. Better than a loose gap ring as it will not tangle and the ends never interfere with each other. The o.d. is specified .010 larger than the i.d. of the tubing.

Expanded gap ring. The ends are gapped by heat treatment and when in position, the ends are closed. Used for internal grooves and for larger tubing than the overlap o.d. rings.

Multi-turn ring. These can be used as an overlap o.d. ring where faster melting is desired. Also to provide more volume than can be formed in a one turn ring.

Arc or segment ring. These have basically two uses: (1) To go into grooves from the side when the ring would distort if pushed over the end of the part—usually 250° arc. (2) For pierced tubing joints that must be made in such a position that a full ring collects too much alloy at the bottom of the joint—usually 210° arc.

Blanked washer. For small joints requiring a washer or whenever thickness must be held to a minimum.

Edgewound washer. For larger joints requiring a washer. As it is formed by winding flat wire on edge, no scrap is generated and no dies are required. Minimum thickness is .010 and as width of wire increases from .062, the thickness must also increase.

Coined washer. Formed by coining a ring. Particularly suitable for small washers of .010 thickness or heavier and quantities of 10,000 and up. The advantage is the absence of scrap and dies.

Curved washer and shim. Not a common preform but sometimes required for tubing joints where matching the curve of tubing speeds assembly.

It is impossible to cover all joint designs, but, from the following, the designer or engineer should be able to translate the idea to his specific application. In every case we try first to hide the preform; failing that, we apply the heat on the side of the joint opposite the preform.

COUNTERBORED JOINTS FOR O.D. RINGS

The easiest joints to locate and preform are those providing shoulders. This can frequently be done by counterboring the female members. A washer is the ideal preform, since it requires the least displacement (Fig. 1). A blanked washer is favored for small diameter joints, the edgewound for large. Where wall thickness permits chamfering the male member, a ring can be hidden in the chamfer and little or no displacement is required (Fig. 2). It is also possible to drop a ring down to the shoulder and permit the parts to settle. However, alloy may squirt into the i.d. if displacement is rapid or cocking may occur where the fit is tight.

Where the male member is a screw machine part or a long joint is involved, grooves can be machined to take rings (Fig. 3). For large diameter joints, the ring will usually have enough elasticity to go over the part and then snap into the groove. In the case of small diameter joints this will not be true, and an arc ring of 250° arc should be pushed into the groove from the side. Where a groove is desired, but wall thickness will not permit the necessary volume of round wire, a flat wire ring will provide more volume with less sacrifice of the wall. It should be pointed out that complete joint penetration is seldom necessary on long joints to achieve the desired strength. The grooves should be placed near the outer seams to avoid excessive heating and to minimize the alloy cost.

SHOULDERS FOR I.D. RINGS AND WASHERS

Another desirable joint design is the external shoulder. This again provides location and, if wide enough, a place to trap the alloy. A washer minimizes

continued

the displacement. If a large fillet is needed for appearance or to avoid a sharp change of section, the o.d. of the washer should extend beyond the o.d. of the male member (Fig. 4).

A ring can also be used and the heat applied to the opposite side of the joint (Figs. 5 and 6). In Figure 5, if the heating is uneven, the alloy may plate out on the flat member. In Figure 6 a chamfer should be provided to lead the alloy into the joint.

A design frequently encountered on hydraulic cylinders and ordnance items is shown in Figs. 7 and 8. When the heating is slow, the inside ring (Fig. 7) is good and appearance of the alloy is assurance of joint penetration. However, when heating is rapid, as with induction or highspeed gas, the sharp outer corners may oxidize before the heat conducts to the ring. Then an edgewound washer (Fig. 8) will melt along the corners protecting them from oxidation, and heating can continue until the desired penetration is achieved.

TUBING JOINTS

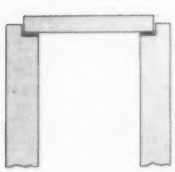
Brazing is one of the best and fastest methods for joining tubing. Bicycles, refrigeration joints, fuel lines and a host of other products are usually brazed. The following are typical designs:

T-joint with no hole in horizontal member. The vertical member is radiused to mate with the horizontal. Slugs or balls can be dropped down the tube, but we usually recommend an overlap o.d. ring (Fig. 9). The o.d. should be slightly larger than i.d. of the tube so that when pushed in, it stays in position. The overlapped ends will adjust for variations in the tolerance of the tubing.

T-joint with hole same as i.d. of vertical member (Fig. 10). An internal ring will not work and to avoid an exposed ring, a washer is necessary. However, a flat washer is awkward to assemble especially if more than .005″ thick. A curved washer (Fig. 11) radiused to the curvature of the horizontal member helps the assembly problem. On saddle joints (Fig. 12) a curved shim is frequently snapped onto the tube and the saddle shape set down over it.

Pierced T-joint. This design is not desirable because the only solution is an exposed ring. When it is necessary, the most workable answer is to jig the assembly at 45° (Fig. 13) and use a half ring. By heating below the tube, the heat conducts up to the ring and an even flow is achieved. One engineer solved this problem by bumping the tube out and putting the ring under the bulge (Fig. 14).

Return bends. Joints on air conditioning coils and other heat exchangers (Fig. 15) must be made rapidly. The multi-turn ring, usually 1½ or 1¾ turns, has worked well. It holds tightly against the



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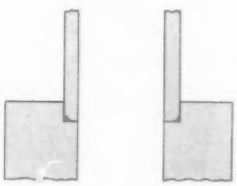

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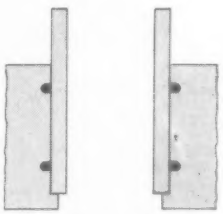

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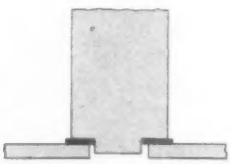

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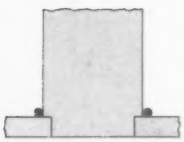

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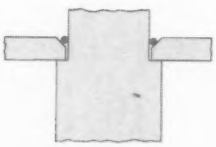

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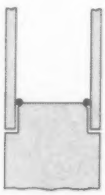

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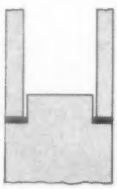

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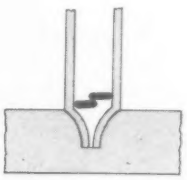

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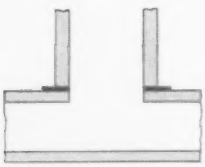

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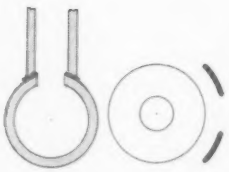

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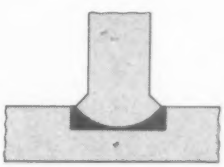

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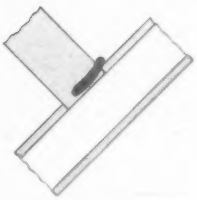

Figure 13

wall, does not swivel, and adjusts readily to the sloping shoulder at the base of the expansion. Putting the proper volume into a greater length of smaller wire results in faster melting than a one turn ring.

The above joints have dealt with thin wall tubing. T-joints of heavy wall tubing present other possibilities. The inlet and outlet fittings of hydraulic cylinders and heat exchangers are typical. Spot facing or counterboring avoids the expense of milling a radius on the fitting, provides machined surfaces free from oxide, and a better design for impact resistance.

This last point can be very important. When a fitting is radiused and there is no support for the side walls, a hard impact as when a cylinder is dropped can place a high stress concentration at one point. This may fracture the joint (Fig. 16). Spot facing (Fig. 17) provides wall support at the point where stress concentration will be highest. As these fittings are usually large, we recommend an o.d. edgewound washer for spot faced assemblies and shims for the radiused assemblies.

Similar joints are encountered on smaller assemblies, such as plumbing fittings and screw machine bodies for valves, etc. (Fig. 18). These should be counterbored to receive the side tubes and a washer or ring dropped into the counterbore. The important thing is to avoid the exposed ring as it runs down the side and not into the joint.

Capillary tube joints. A great many electronic devices and bulb thermostat assemblies use small diameter tubing. Frequently it is impossible to wind a ring to the i.d. and wire diameter desired. For example, a .040 i.d. x .015 wire. But a .040 i.d. x .010 wire x 2½ turns can be made and will supply the necessary volume (Fig. 19). Also, the multi-turn ring will not tangle, while the one turn ring will, as it will have a full helix. Attempting to untangle .040 i.d. rings can be a frustrating experience. If a small i.d. of one turn is demanded, a blanket washer is better than the ring.

Pierced joints. It is not possible to eliminate all pierced joints although the effort should be made. When they are inevitable, the following may be helpful.

On thick gauge metal where the hole has been drilled (Fig. 20), a chamfer or counterbore should be provided for the brazing alloy. The chamfer serves primarily as a well for molten alloy and need not be so large as to submerge the ring. On thin gauge metal, holes are generally extruded to provide more brazing surface. The radius formed serves the same purpose as a chamfer (Fig. 21). A snap-ring tight on the tube will stay in position. Heat should be applied from the opposite side of the joint to pull the alloy through.

Cap joint. In a common design for capping cylinders (Fig. 22), a gap ring is positioned in the cap so

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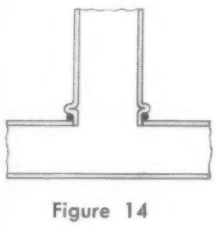

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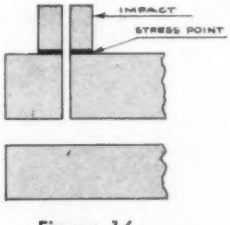

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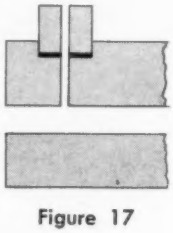

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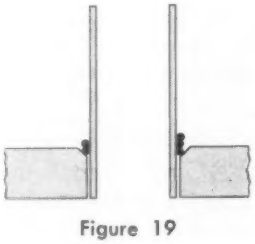

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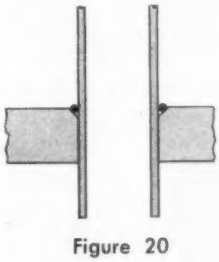

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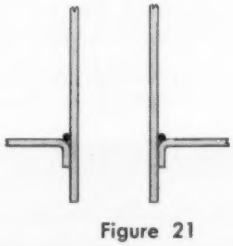

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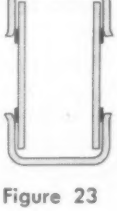

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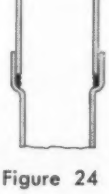

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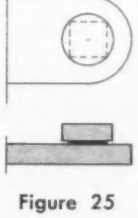

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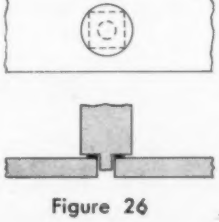

Figure 26

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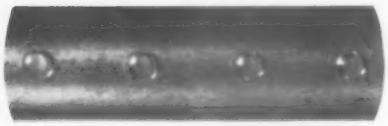

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that it holds tight against the sides. Heating the cap more rapidly than the can will hold the alloy to the joint.

The drier assembly (Fig. 23) cannot be handled as in Fig. 22 because no flux is permitted inside the drier. Therefore, the caps are belled out slightly at the top and a flat wire ring wedged into the belled out section. This helps to prevent alloy from spilling to the outside.

In another similar design (Fig. 24), the wall is thin and the expanded shoulder is not sharp. This makes it difficult to hold an internal ring in position. Again, the lip can be belled out to take a flat wire ring.

Contact type joints. A wide variety of joints which are circular in shape can be handled with square shims or washers. These can be made with little or no scrap and capillary action will pull the alloy through the joint. A circular disc joint may be made more economically with a square shim (Fig. 25). Where a small lead is provided for location, a square washer accomplishes the same thing (Fig. 26).

In the foregoing discussion we have stressed the most desirable condition of burying the alloy and pulling the alloy to the outside of the joint. This assures penetration and keeps alloy costs at a minimum. These are, however, situations where a large fillet is required either for appearance or to avoid a sharp change of section. The fillet adds little to the tensile or shear strength of the joint, but does add to the impact and fatigue strength. Where this is necessary, the designer has little choice but to expose the ring. An effort should be made to heat from the opposite side and for large diameter joints, stress relieved rings should be specified to avoid expansion of the ring away from the joint.

A final word might be said about the ordering of rings. Instead of the usual plus or minus tolerance, the tolerance should be expressed all in one direction, whether it be plus or minus. •

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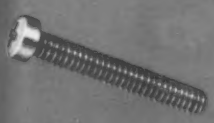

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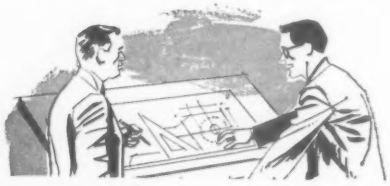

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This article tells why bolting is now favored in the pre-fabrication of structural steel

HIGH STRENGTH STRUCTURAL BOLTING

by **Fred E. Graves,** Asst. Technical Director
Russell, Burdsall & Ward Bolt and Nut Co.

and **Robert C. Kidd,** Industrial Engineer
Mississippi Valley Structural Steel Company

In high strength bolting of truss, the assembly of chord, gusset and web member is similar to fit-up for riveting. Truss remains in original position while bolts are tightened with torque-controlled wrench. With riveting, as pointed out in article, extra operations are required.

This article is concerned with the pre-fabrication of structural steel by riveting as compared to bolting with high tensile fasteners. It is based on cost comparison studies made at the Mississippi Valley Structural Steel Company, in Melrose Park, Illinois.

Cooperating in the studies were RB & W, Mississippi Valley, and Albert Ramond & Associates, consulting engineers specializing in work measurement. The results of these studies are of interest because they point up opportunities for other structural steel fabricators to increase the capacity and/or efficiency of their plants in tons per man-hour.

A major conclusion of this study is that the use of high tensile or high strength bolts—in place of rivets in typical structural assemblies—will result in a production increase of 66% for a fixed number of man-hours and a fixed size of production area.

Selected for the study was the steelwork in a 500-ton job designed for shop riveting rather than bolting. Three classes of work were involved: trusses, braces, and beams. Duplicate quantities of each were assembled with high tensile bolts and with rivets. Twelve 7400-pound trusses, each 80 feet long,

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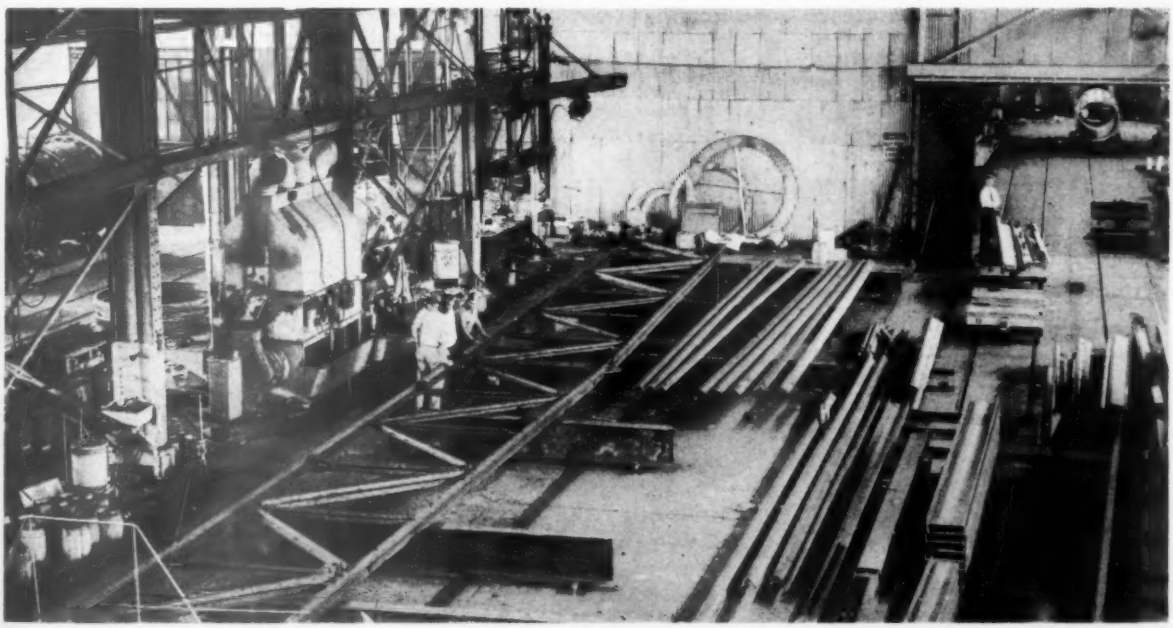


Site of recent cost comparison studies on pre-fabrication of basic structures by riveting vs. high tensile bolting.

were assembled in halves, with 12 half-trusses bolted and the same number riveted. In addition, 48 simple braces and 54 beams were also bolted and riveted. Each complete truss required 295 fasteners, each brace 6, and each beam 10. All bolts and rivets were ¾-inch diameter size.

In effect, we took a normal riveted job and bolted half of it. Both the riveted and bolted assemblies used common bolts in the truss web member ring fills. All preparation work (everything in the work order package) was exactly the same up to assembly, and nothing was altered in the methods and procedures used in the determination of this study. It was fortunate that we could find a customer willing to accept his job half riveted and half bolted, and it was also fortunate that a job was available that could be so easily divided to give as accurate a picture as possible.

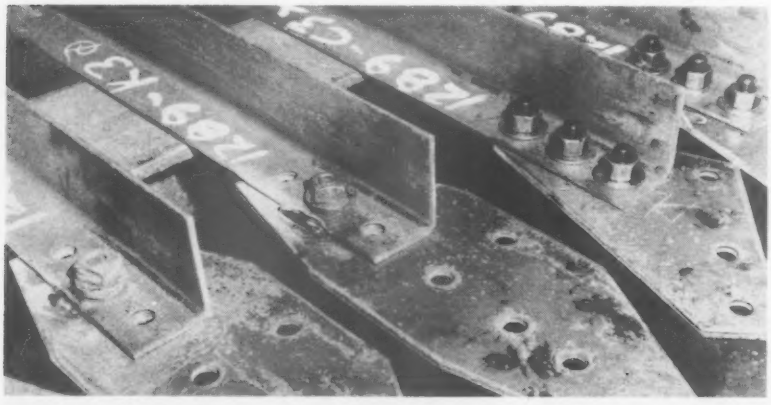
Let's begin with the procedures and elements of fit-up bolting of a truss preparatory to riveting. The completed truss was built in half-sections and spliced. The chord angles are placed upon skids and the crew begins assembly with fit-up bolts and ring fills. The gusset plates are assembled to the chord angles and web members brought into place. Drift pins are used to align the sections and the entire truss is bolted for the riveting operation. The truss is then tack welded after inspection to assure proper alignment in transport and to expedite the riveting operation. The rivet crew selects the truss from storage and takes it to the rivet skids. Drift pins and fit-up bolts are removed before the riveting begins. The holes are reamed for easy entry of the rivet, and the crew begins the process of driving rivets after which the completed truss is ready for the shipping yard.

The types of riveting checked were pneumatic and hydraulic, the latter with both three and four-man crews. The three-man hydraulic operation was selected as the basis of comparison, it being the most modern and less costly method. Excess bolts and drift pins must now be collected and sorted for reuse.

Comparing this to a high tensile bolted truss, we begin with the same procedure of aligning the top and bottom chord angles, and setting in the gusset plates at proper locations. The web members are then assembled throughout the truss, having been preassembled in pairs prior to final assembly. Pilot wrenches are used for proper alignment, and a minimal number of drift pins are used to make easy application of the high tensile bolts. These bolts are then snugged up with an automatic torque controlled wrench, and the truss is ready for inspection. After proper camber requirements are checked, the truss is moved from the bolt-up skid directly to the shipping yard, a complete product.

Bolting gusset to brace (above) requires only one man, while riveting (right) requires two men.

Now let us examine the processes of fit-up bolting and riveting beams compared to high tensile bolting beams. In both cases, the end connection area is freed of all burrs using a high-speed grinder, and the detail angles are placed preparatory to the bolting operation. A single bolt is used to fit up the end-connection angles. It is aligned, tightened, and finally tack welded in position to insure alignment during transport. The beams are removed from the fit-up skids and placed in storage, then transported to the rivet area and placed upon the rivet skids. They are sorted and the bolts removed prior to the spear-reaming operation. Rivets are then heated and driven in place, using portable hydraulic equipment. A mistake



Two braces in foreground are prepared for riveting with fit-up bolt and tack welding, with bolt removed before riveting. For other braces, the fit-up bolt is retained and two more bolts added to complete the assembly.

in driving can mean time wasted in burring and backing-out a bad rivet. The beams then move from the skids to the shipping yard.

High tensile bolting starts with the application of a single bolt in the end connection, tightening the bolt sufficiently to permit proper alignment of the connection. Addition of a second bolt permits permanent tightening or drawing up of the first bolt, and reaming of the remaining holes as necessary and then final torque-tightening of the entire connection. The completed material is ready to be moved directly to the shipping yard.

The third category covers simple bracing material. In the fit-up for riveting, the gusset plate is fixed with a single bolt and drift pins are used to align the plate

continued

Bolting end-connection angles on beam (above) is one-man job, while riveting (left) is a two-man job.

WHAT'S BEHIND THE HIGH STRENGTH BOLT

by **Edward R. Estes, Jr.**, Research Engineer
The American Institute of Steel Construction

Since the first application of high strength bolts in the construction industry there has been a phenomenal increase in their use in this country. Few developments having such a wide application have been so readily accepted as a standard of construction practice.

The Research Council on Riveted and Bolted Structural Joints (founded in 1947) issued its first specifications for high strength steel bolts in 1951. Previously, a substitution of bolts for rivets meant the use of either unfinished bolts, turned bolts in reamed holes, or ribbed bolts. Today, however, high strength bolts have almost completely replaced rivets in field connections of buildings and also bridges.

Of the 20 buildings over 25 stories in height completed in New York City since 1955, only three have used rivets exclusively for field connections. Under construction now in New York City are buildings 42, 53, and 60 stories tall, all of which will be high strength bolted in the field.

Among the monumental bridge spans erected in the past several years, the Mackinac Bridge, Carquinez Bridge, and the Mississippi River Bridge at New Orleans, all used high strength bolts. A bottom lateral bracing system, using high strength bolts, was added to the Golden Gate Bridge.

These are just a few of the larger structures which have been field bolted in the past few years. The total number of bolted structures, both large and small, represent a major portion of those erected today. The quantity of high strength bolts used in structural applications since 1951 will pass one million.

There are several reasons behind this rapid acceptance of high strength bolts by engineers and architects all over the country. Each could stand alone as justification for the use of these bolts.

The tightening of a high strength bolt, using a pneumatic wrench, makes much less noise than the driving of a rivet. Thus, the reduction of noise has been a factor.

Economics also play an important part in the acceptance of any new development. Only two men are needed to install high strength bolts, while four are required in a rivet crew. Not only are fewer workers required, but a bolt crew is able to install more bolts in a given time than a rivet gang. This has offset the fact that one such bolt costs more than one rivet.

Laboratory and field tests under the sponsorship of the Research Council showed that high strength bolted joints were as good as or better than riveted joints and could be relied upon in extreme conditions of loading. The concept of transmitting forces in a connection by friction resulting from the high tension in the bolts was proven to be practical.

The "Specification for the Assembly of Structural Joints Using High Strength Steel Bolts" is endorsed by both the American Institute of Steel Construction and the Industrial Fasteners Institute.

Bolt, nut, and washer material conform to the "Specification for Quenched and Tempered Steel Bolts and Studs with Suitable Nuts and Plain Hardened Washers" of the American Society for Testing Materials (ASTM designation A325).

The dimensions of the bolts and nuts conform to the requirements for regular semifinished hexagon bolts and heavy semifinished hexagon nuts given in American Standard B18.2-1955. The washer dimensions conform to American Standard B27.2-1958. The high strength bolt in structural joints has truly been a cooperative effort on the part of many organizations.

As a result of further research, it is apparent that the allowable working strength of high strength bolts will be increased in the near future. •

From an address before the American Standards Association 10th National Conference on Standards, in Detroit, October 20-22.

properly. The plate and angle are then tack welded to insure alignment during transport and the material is ready for riveting. After reaching the assembly floor, usually from the intermediate stage of storage, the fit-up bolts are removed and the connections spear-reamed. Then the rivets are heated and driven in place. The accumulation of fit-up bolts and fills on the floor all must be collected, sorted, and returned to use in assembly. The bracings then are moved to the shipping yard.

In high tensile bolting, the bracing angles are spread as before and the bolts hand-tightened in place. The fit-up man locates the gusset with the correct bevel directly from the drawing. Connections are aligned by using the drift pins and one bolt is drawn up slightly. The other bolts are fixed in place and the connection is properly aligned for correct dimensions. All bolts are then tightened with an automatic torque wrench, and the finished product removed from the fit-up skids directly to the shipping yard.

We would like to emphasize the number of moves required and the resultant handling that can be eliminated with high tensile bolting in the shop. In conducting cost studies, the following conditions were considered:

First, performance of workers, which was above normal during most of the time studies. In accordance with accepted industrial engineering practice, all observed times were levelled to normal.

Second, the methods used by the men were found to be acceptable since they were accustomed to riveting. Methods employed on the bolting operations were improved during the studies, and the best methods were used in developing the standards.

Third, all rework was excluded from the standards in both bolting and riveting.

On the basis of the work studies, labor savings attained indicate a substantial increase in tonnage is possible by bolting instead of riveting. This amounts to 66% more output without an increase in work-force or plant size.

On the six trusses, 48 braces and 54 beams which were assembled by riveting and by bolting, the following figures were obtained: operating cost for bolting was 39.8% less than for riveting: while material costs were several times greater for bolts, nuts and washers than for rivets, rivet heating, fit-up bolts, welding rod, total labor, overhead and material comparisons show a 2% advantage for bolting, plus the substantially higher tonnage per man-hour.

Now for some observations on other factors that similar fabricators will want to consider when comparing bolting and riveting. One is the equipment required for each job. For riveting the following is needed: fit-up bolts and nuts, rivets, pneumatic impact wrench and holding wrench, spear-reamer, air compressor, welder and various appurtenances for welding, such as hand riveting gun, bucking bar, gas and/or electric rivet heater, hydraulic and/or

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For shop bolting, only the following is required: high tensile bolts and nuts, washers, pneumatic impact wrench and holding wrench, spear reamer, air compressor and hand torque wrench for inspection. We have not included drift pins, miscellaneous hand tools, overhead cranes, etc., that would be required for both bolting and riveting.

Now let's summarize some of the advantages offered by bolting vs. riveting in shop assembly of structural steel parts.

First is increased tonnage—a 66% increase in tonnage potential with bolting instead of riveting.

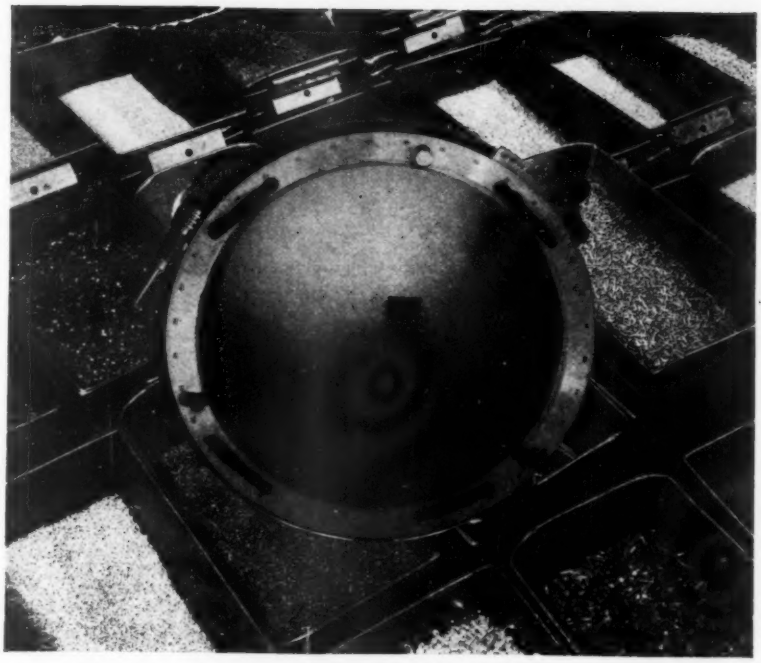
Second is the ability to capitalize on more efficient pre-assembly preparation, and without increasing man-hours or floor space.

Third is the additional savings in material and operations created in bolting by eliminating the necessity for "developing" or "livening" fills for end-connections on beams or girders.

Fourth is design economy. Recent tests indicate a higher tensile-shear ratio for bolts than for rivets. At present, bolts are substituted for rivets on a one-for-one basis, but if a designer can utilize fewer bolts or smaller diameter bolts in a joint specifically designed for bolted connections, the cost savings possible are obvious.

Fifth is greater plant flexibility. Riveting requires space for fit-up, for storage before riveting, and for the rivet operation itself. In bolting, fit-up and bolting take place at the same location and with the same fasteners.

In conclusion we must be aware that reinforced concrete and prestressed concrete are putting greater and greater pressure on fabricators. The way to combat this is to improve the economies of steel fabrication. And we feel that a study of the possibilities presented by the use of high-strength bolts for shop assembly can enable the steel fabricating industry to produce lower cost assemblies at a considerably higher production rate. Plant modifications necessary to take advantage of bolting's inherent potential can be made simply and with little or no capital outlay. •



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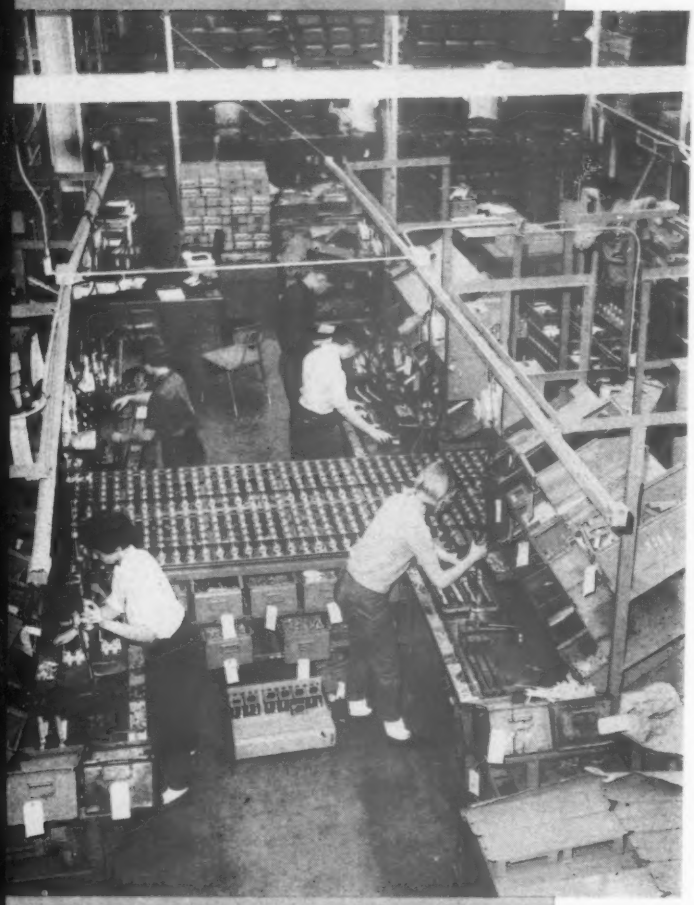


Related products are assembled in unitized production areas called "tracks," so termed from the conveyor system around which each line is built. Off each track comes a complete assembly, packed for shipment.

Controlled Flexibility For Volume Assembly

by **Darrell Ward**
Engineering Editor

A highly competitive catalog item requires mass production economy. And, a line of merchandise featureing a wide variety of standard items must be flexible enough to switch quickly from one type of unit to another if heavy stockpiling is to be avoided. Flow of parts through such a system requires well coordinated material control. These are features we found in an "enclosure plant" where distribution equipment, such as safety switches of various types, fusible service equipment, circuit breaker load centers, lay-in duct and fittings, and other similar items are made. All are principally assemblies of electrical devices inside sheet metal enclosures.

The plant was laid out to provide assembly "tracks" (integrated assembly areas), each carrying only one item for high volume production. For low volume items, one assembly track could carry a variety of units, different ones being assembled at different times.

From the established or estimated information on production requirements, unit time, and functional breakdown of the job, engineers determine how many work

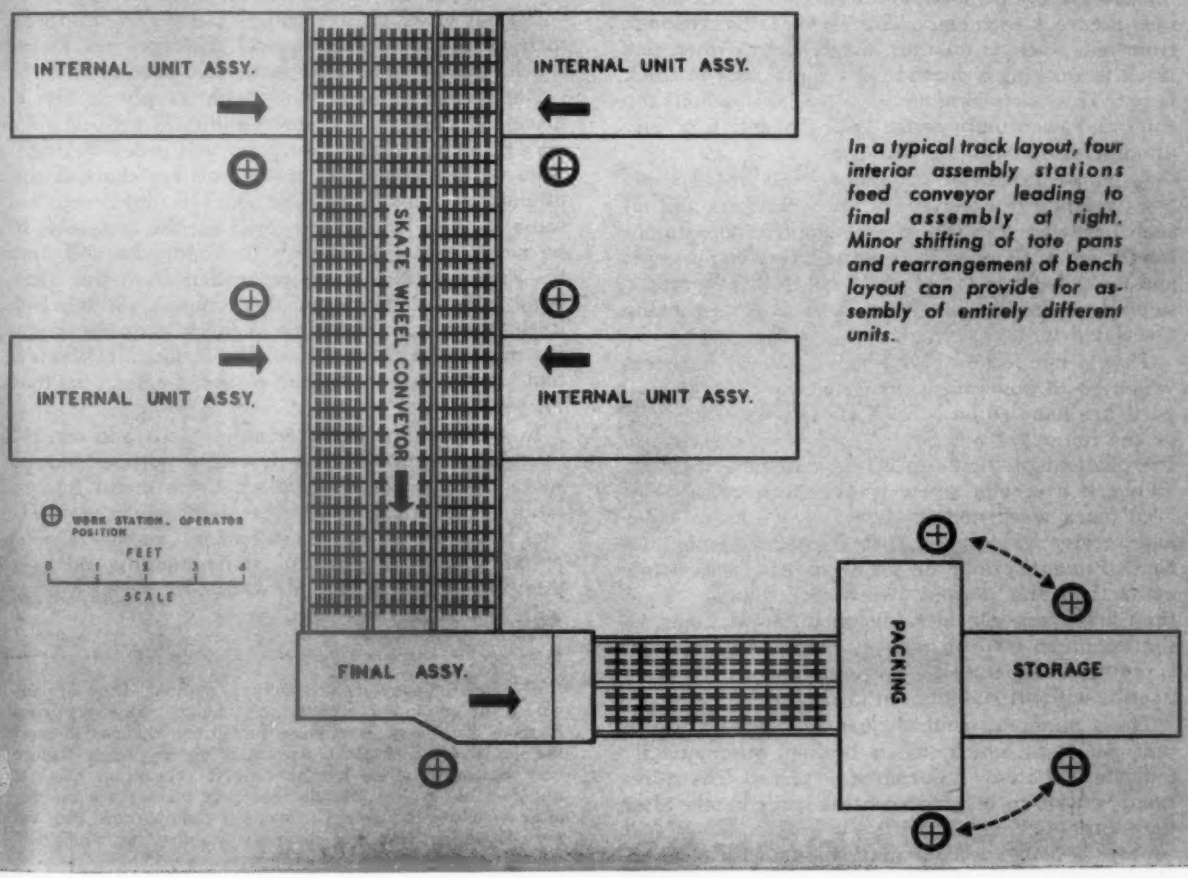
This article discusses methods of standardization, assembly flexibility, materials control and small tool control which can be valuable for practically any assembly plant.

stations are required, how many benches, tools, conveyors, assembly fixtures, tote pans for each work station, and bulk storage. All of this information makes up the basic engineering package, a starting point for any one assembly track.

The engineers have realized what seems to be the ultimate in flexibility through standardization of equipment, methods, and the organization of single track assembly for each production unit. If a new line or a new product is to be put into production on short notice, appropriate assembly tracks can be set up, rebuilt or modified over a weekend so that workers may proceed without delay in the first shift on Monday.

All equipment is functional. Workbenches, for example, are mostly standardized to an average 30-31" work height for low units where workers reach down inside a box. Others are higher for assembly of readily accessible parts.

continued



In a typical track layout, four interior assembly stations feed conveyor leading to final assembly at right. Minor shifting of tote pans and rearrangement of bench layout can provide for assembly of entirely different units.

A maintenance crew produces the workbenches and, with cutting torches, can extend or modify any workbench on short notice. The same applies to associated shelving, overhead monorails supporting tools, and conveyor systems which serve the track area. Anything can be enlarged or reduced as needed for a given planned layout.

Feedrail overhead monorails support the driver tools at convenient positions over work stations. Each is equipped with a Thor balancer to offset the weight of the tools and avoid worker fatigue. The monorails come in sections of various standard lengths which can be butted together to make a continuous run of any desired length.

Different conveyor tracks are selected according to the device or unit to be built. Skate wheels are used for the large heavy units. Some skate wheel conveyors are adjustable for different widths to accommodate different enclosure boxes. Ball caster table conveyors are used at the end of a final line to allow multi-directional handling of units at the packing stations.

Practically all tools at assembly stations are power driven, some by air and some by electricity. These tools are interchangeable between work stations on a given track and between tracks through the plant.

The feedrails, hangers, balancers, connectors and driver tools are all easily demountable. Driver tools, themselves, are demounted for storage in lock boxes near the track each night. This prevents "borrowing" from one track to another, a temptation when one track is working a second shift and a nearby track is not. This borrowing could extend throughout the shop and eventually cause total disruption of any attempt to account for tools.

A more Herculean task, however, would come from keeping track of rivets, nuts, washers and all such hardware, if the materials control department kept track of these as it does the larger components and tools. Large items are card controlled according to production requirements, a single IBM card being associated with each part.

This is not feasible for the millions of fasteners which go through the plant each day. These small parts are handled on a basis of "minimum control" or the minimum number of each item required in the plant at all times to offset lead time. For example, if a certain screw is used in a quantity of 5000 for a week and it takes two weeks to order and receive delivery of that screw, the minimum control quantity may be set at about 12,000, a few more than the normal two-weeks' supply. Lead time may vary considerably on different items, so the minimum control quantity may consist of what is required to operate a week, a month, or even three months without running out of parts.

These minimum control quantities are put up in unit packages which, when broken, automatically indicate that a new order must be placed. The storeroom reports to material control immediately after the minimum control package is broken. While that supply is being used, a new shipment is ordered. The new shipment may be enough to run for three months or more, although the minimum control quantity runs only for two or three weeks. This will be to take advantage of quantity discounts and standard vendor packaging.

Production is supplied out of the mass lot of parts. The store room maintains the minimum control quantity package until the bulk lot is consumed. When the last of the bulk parts is used, the minimum control package is broken and a tag attached to the package is sent to material control along with a requisition for more. Material control issues purchase requisitions to purchasing.

Non-production supplies and most tools are handled in a somewhat similar manner. When a new assembly track is set up, requirements for power tools and special tools are determined by industrial engineering. This provides each work station with basic tools and spares for the tool crib. The tool crib also maintains minimum control quantities of replacement parts which have been established by the maintenance foreman. Spare parts are retained in minimum control quantity packages like production parts. When the package is broken, this is reported to purchasing for a replacement supply.

A typical example is in the case of air driver clutches. These parts normally are used at the rate of three to four per month. It may take six weeks for delivery. The foreman may determine that a safe minimum control quantity would be five parts. However, purchasing might order a vendor's package of 24, out of which five will be put up by the foreman as the minimum control package, not to be touched until the first 19 parts have been used.

Non-powered hand tools such as pliers, screw drivers, hammers, and low cost items are handled on a minimum control quantity and order quantity as are other items. But, these tools are charged out to individual workers. The worker may keep the same tools as long as he works for the company. If he never turns in his tools for credit, he will find his final pay check, on separation from the company, with a deduction in that amount. He does not have to run back and forth to check in or check out the miscellaneous small tools for each shift. When a tool is worn or broken, the worker turns in his tool for replacement or repair.

In studying the engineering methods and control techniques applied, there is really nothing that is so radically different from what one might find in other plants. What makes the plant appear interesting, however, is that management, engineers, and workers have a clear-cut understanding of how things are run and they all work together as a team with clockwork precision. •

Note: The company name has been omitted. They are involved in continued growth and change. At every step, Methods Engineers have plans for future changes to meet the needs of a new plant. An article on any single feature may become obsolete by the time it appears in print, if one does not realize that changes have taken place the day after a picture is taken. The name is unimportant. But, the very flexibility discussed obviously is something which will trigger new ideas—Ed.

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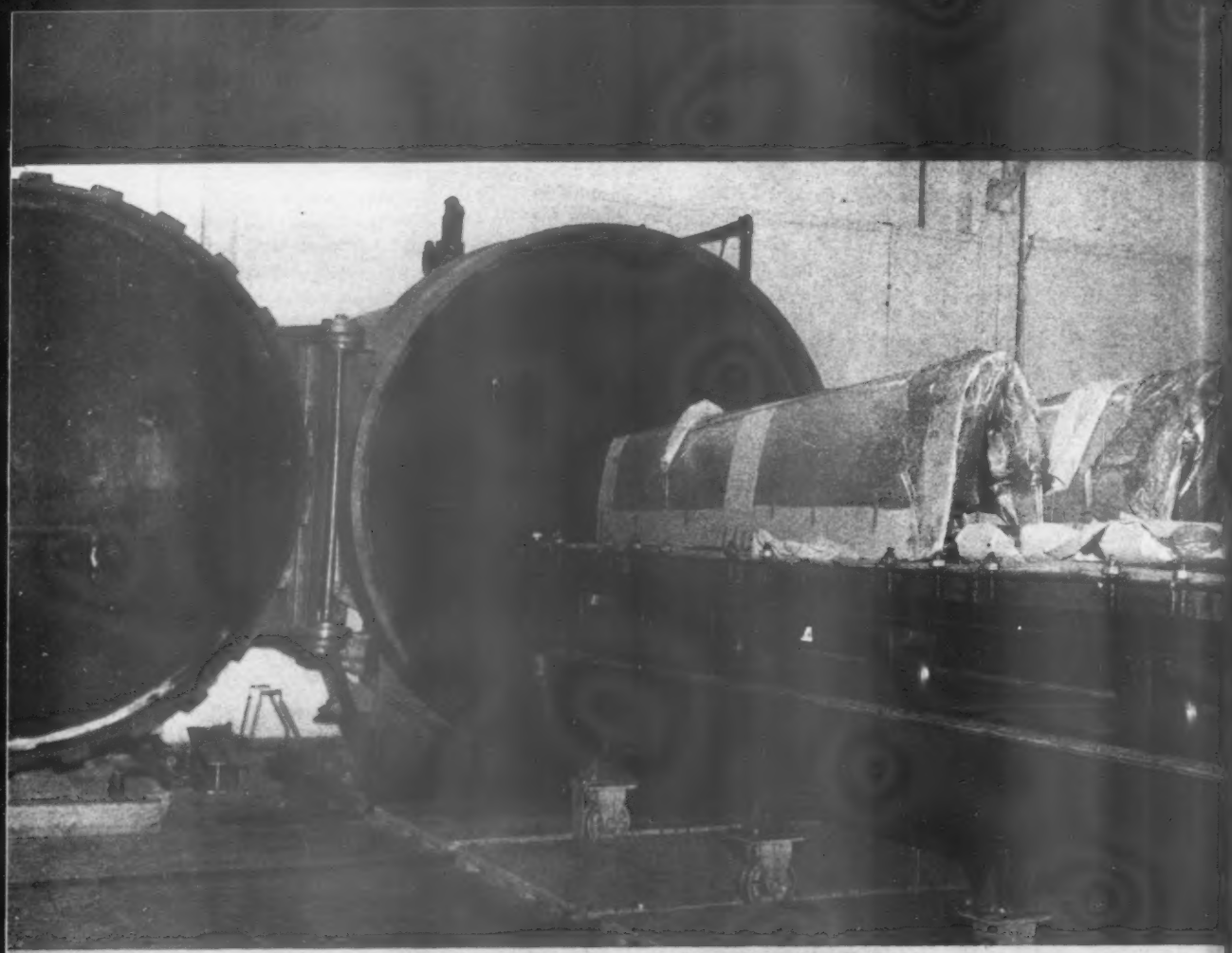


Two aircraft structures, under plastic bags, move into a giant autoclave for bonding.

BONDING HONEYCOMB STRUCTURES

Considered honeycomb for your product? Here's one how-to-do-it.

by **William D. Engstrand**
West Coast Editor

While bonded honeycomb structural materials have been used for many years in aircraft and missile construction, largely because of their very favorable strength-weight ratio, the early cost of these materials served to keep them from being used in all but very high quality commercial products. But today, with the science of metal bonding well advanced, and with more companies equipped and tooled to produce bonded structures, the cost factor is being attacked from all sides. Many quality commercial products already include bonded structural material in the more important phases of their construction. There is real promise that in the very near future even more bonded structural material will be used in commercial production.

This, then, brings up some logical questions. How must a plant be tooled to produce these bonded structures? What technical details are involved? How much control must be exercised to assure maximum and consistent quality in bonded structural material?

To get the answers to these questions, we visited Monrovia Aviation, a subsidiary of Telecomputing Corporation in Monrovia, Califo: nia. Monrovia Aviation was an early entrant in the metal bonding field, and for years has been producing top quality bonded structural materials and bonded components for both airplanes and missiles. Their techniques have been continually refined to keep pace with the advance of know-how in metal bonding. Equipment is constantly added or modified to meet the expanding requirements of the field. Their problems and facilities parallel the problems and facility requirements which would be faced by any commercial manufacturer intending to produce high quality bonded products.

Art Lopez, Monrovia Aviation's Process Engineer, encompassed the principal technicality of bonded production in a sweeping statement. "Successful production of bonded structural materials or bonded components is largely dependent on rigid in-process quality control throughout. In fact, to a large degree, this in-process control must supplement final inspection. The only way to determine the strength of a bonded joint is to test it to destruction. This is a laboratory procedure, and not compatible with production line inspection techniques. The in-process quality control exercised must assure that each bonded joint is as strong as it should be, and leave no room for question marks!"

The degree of in-process quality control maintained at Monrovia Aviation will be emphasized wherever applicable throughout this article.

Products made include both bonded honeycomb structural panels and bonded parts with a honeycomb core. Most of the parts are of aluminum construction, though a few bonded phenolic honeycomb structures are also produced. The components for some parts are preformed by the prime contractor; other parts are completely fabricated, assembled, and bonded in the Monrovia plant.

The details of production, such as bonding time and bonding temperature, vary somewhat to meet the specification requirements of the prime contractor. But from the manufacturing standpoint, these details are not important and the variances are well within the scope of approved bonding practices. More important is the series of in-process quality control measures used to make sure the

continued

Metal fittings on honeycomb are "foamed" in place by a pigmented adhesive which expands when heated. Jigs accurately position each fitting.

Bonding Honeycomb Structures, continued

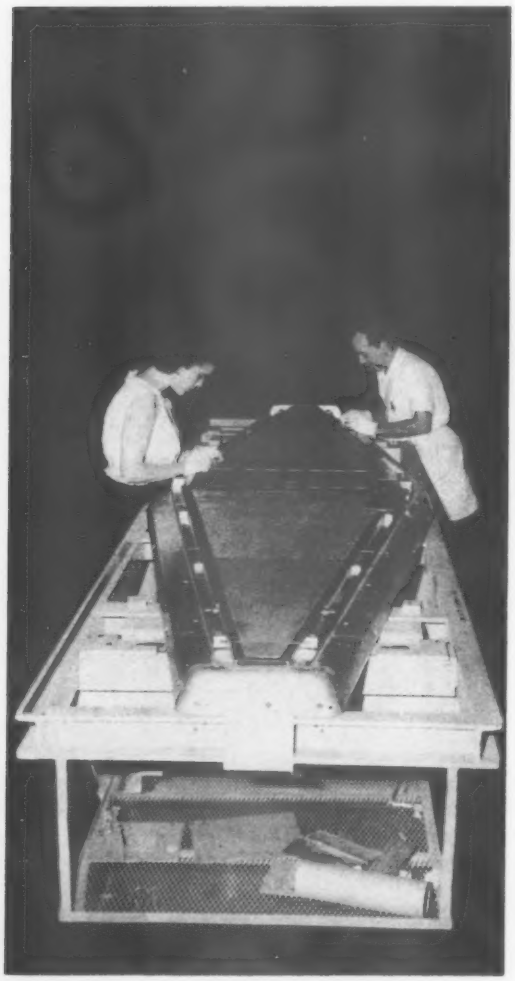
part will meet specifications, and flexibility of equipment to encompass any required deviations.

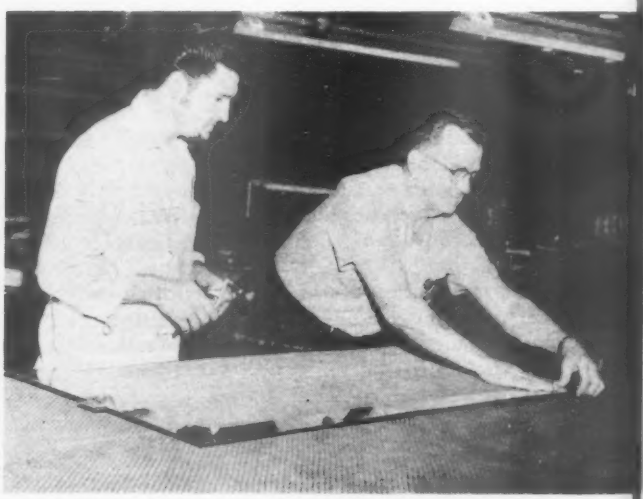
Monrovia Aviation's shops are located in three large buildings, each 100 by 390 ft in size. One building is used for fabrication, the second for assembly, and the third for bonding. Production equipment in each building is carefully suited to the work it must perform. Much of the equipment, and especially the machines used to produce honeycomb core shapes, has been modified by the company's tooling department. Large mills, for instance, have been equipped with cutting heads which follow a template contour while contouring honeycomb shapes.

Vacuum chucks are used on the mills which contour honeycomb shapes. A flat piece of honeycomb is first bonded to a false skin, then one side is contoured in a mill guided by a template. The flat false skin is then removed, a contoured skin is applied on the contoured side of the honeycomb, and a contoured vacuum chuck is used for holding while the second side of the part is milled. Prior to this machining, metal fittings are "foamed" in place in the honeycomb, using a jig to position each fitting accurately. Foaming is accomplished by a metal pigmented adhesive which expands when heated. This foaming adhesive adheres both to the metal fitting and the honeycomb material, thus holding the metal fitting in place. The metal fittings are end-milled to size in the same template guided mill used for contouring the honeycomb core. Valve stem cutters are used for contouring the honeycomb.

In addition to contoured parts with a honeycomb core, many honeycomb sandwich panels are produced which provide exceptional strength with minimum weight. These panels fall in two general classes—panels which sandwich a formed metal ring of honeycomb material, and crushed edge panel assemblies. In the former, the panel skins are preformed to "cup" around the honeycomb core and the skins meet at the edges where they are bonded together. In the second type, a flat piece of honeycomb core with the same dimensions as the skins is sandwiched. This type of panel is formed after the sandwich has been assembled, and the edges of the honeycomb are crushed between the edges of the skin. The accompanying photos will aid in visualizing the difference between a formed ring and crushed edge honeycomb panel assembly.

The assembly of bonded honeycomb panels actually starts at the fitting table where all components that will go into a panel are grouped and fitted together. This is a critical operation since all faying surfaces which will eventually be bonded must fit within .005". Wider spacement between faying surfaces would result in a poor bond. Though most of the component parts reaching the fitting table have been pre-formed, some hand work with a file is required to obtain the almost perfect fits necessary.





Left: A comprehensive aircraft structure is laid up; Top: Parts to be bonded are laid up; Right: Process engineer Art Lopez inspects a bonded part which has been destructively tested.

Here, also, a very important phase of in-process quality control enters the picture. After the components for a panel assembly have been fitted and racked together (so that the same components will be assembled together during bonding), test panels are made up and placed with each group of parts. These test panels follow their associated group of components throughout the cleaning cycle, lay up and bonding. They emerge as bonded test panels which have been subjected to the identical processing conditions encountered by the parent panel itself. Subsequent laboratory checks on this test panel indicate conclusively the condition of the parent panel itself.

After fitting, the grouped panel components (along with the test panel components) are chemically cleaned. Though the cleaning process has some variations according to customer specifications, it generally consists of six specific operations. The components are first degreased, then pass into an alkaline cleaning solution operated at 160° F. This is followed by a submersion rinse at the same temperature, then into a deoxidizing solution also at 160° F. A final spray rinse with deionized water removes all chemicals from the component surfaces. The spray rinse is followed by a quick oven dry. The panel components are ready then for adhesive application, lay up, and final bonding.

Process Engineer Lopez points out that all handling after cleaning is a "white glove" operation. No dirt of any kind must be allowed to contaminate a bonding surface or the adhesive applied thereon. Air conditioning is used to supplement clean handling in the layup room.

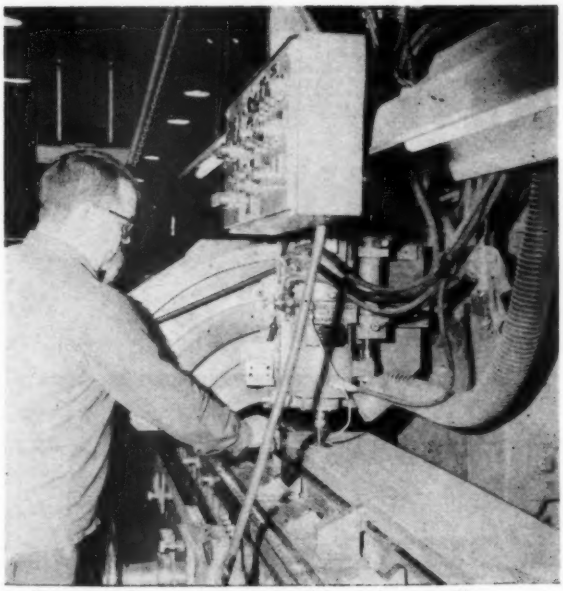
While many metal-to-metal bonding adhesives are available, the one in major use at Monrovia Aviation is a composite film material, employing an epoxy resin on one side which bonds with the honeycomb core material, and a 3M nitrile phenolic resin on the other which bonds with the solid metal skins.

Layup of parts is accomplished on the same die or form block that will hold the panel during bonding. After adhesive application and layup, vacuum pressure is employed to hold the components rigidly in place. A polyvinyl blanket, sealed at the edges with chromate paste, is laid over the assembly and air is evacuated from beneath it. Thus, atmospheric pressure actually serves as the holding medium.

Parts move directly from the layup room into the adjacent bonding department, with the polyvinyl blanket protecting them from any possible contamination until bonding is performed. The bonding room contains three major pieces of bonding equipment—an oil-heated vacuum platen and two oil-heated autoclaves, each 8 ft. in diameter and 26 ft. deep. The autoclaves are recessed in one wall so that only a short length extends into the bonding department. This provides more working space and eliminates "working around" two bulky pieces of equipment.

When the vacuum platen is used for bonding, the tool containing the laid up parts is simply placed on the table. Then the platen is heated to the required bonding temperature. One of the two auto-

continued

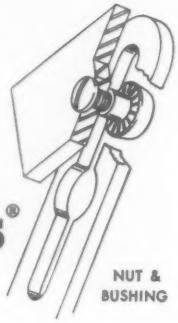


A honeycomb part is contoured on a large mill.

The autoclave control panel records the rate of temperature rise, cooling and time held.

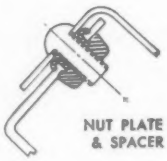
Plastic bags permit vacuum to be used for bonding pressure.

GAIN NEW DESIGN FREEDOM WITH TRS Perma-Nuts®



NUT & BUSHING

You *can* have your cake and eat it too — if you use Perma-Nuts in your assembly designs. With these unique TRS fasteners, you keep all the advantages of threaded attachments, and gain all the simplicity, speed and economy of automatic riveting.



NUT PLATE & SPACER

Here are just a few of the many fastening spots where a Perma-Nut does the job *best.* Each Perma-Nut has from 3 to 4½ clean threads, entirely within the head thickness, to give it ample screw-holding strength. Serrations under the head bite into the surface when the fastener is set, acting as a built-in lockwasher to prevent turning. The head itself takes no more room than a standard hex nut of the same thread size. Nine thread sizes are available, from #3-48 to ¼-28, in steel, brass or aluminum.

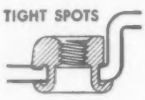
FLUSH MOUNTED NUT PLATE

NUT & RIVET

NUT & RIVET & SPACER

In many cases, actual product design improvements have resulted from imaginative use of these cost-cutting fasteners. Your TRS man has worlds of experience in their use. Find him in the "Yellow Pages" — or write us direct, for fast, efficient, economical help.

IN TIGHT SPOTS



TRS TUBULAR RIVET & STUD COMPANY
QUINCY 70, MASSACHUSETTS

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claves also merely heats the platens. The second autoclave heats both the platens and the vessel itself.

While bonding temperatures and times vary with specification requirements, parts are usually heated to between 250° and 350° F. and held at that temperature for approximately 30 minutes. Within limitations, actual times and temperatures are not as important as rigid control of the bonding cycle so that the specified times and temperatures are repetitively duplicated. This assures consistent bonding quality.

To obtain this control, electronic recording devices make a permanent record of each bonding cycle. Information is transmitted to a control panel from thermocouples embedded in each assembly. The rise to bonding temperatures is accurately recorded at so many degrees Fahrenheit per minute; maximum temperature, the time during which it is held, and any variation therefrom, is recorded; and cooling time and rate is also recorded. This information is automatically inked on graph paper, which becomes a permanent record.

This exacting in-process quality control is supplemented by a great deal of precision laboratory quality control work. A special laboratory centrally located in the Monrovia Aviation shops maintains a "watch dog" attitude at all times. In addition to shear testing and climb-peel testing of the test panels that accompany each assembly through the cleaning, layup and bonding processes, this laboratory runs a periodic 96-hour check on all adhesive being used. This includes the special adhesive used to "foam" metal fittings in place in the honeycomb core, and used in some cases to seal the edges or cored panel assemblies.

In addition to these consistent laboratory controls, one out of 25 actual bonded assemblies is destructively tested and inspected. The bonded skins are peeled off to determine bonding strength. The adhesive line (similar to the "glue line" in wood work) is carefully inspected for inconsistencies, continuity, and method of separation during skin peel off.

"This visual inspection of the adhesive layer after a part has been destructively tested will tell an experienced metal bonder exactly how his processes are performing," says Art Lopez.

The long and successful operations of Monrovia Aviation Corporation in the metal bonding field make it apparent that they are not over-emphasizing the degree of quality control necessary in top-quality bonding work. Every quality control effort is staged and carefully executed. Nothing is left to chance. The net result is consistent production of critical bonded aircraft parts where failure could mean the loss of a $5 million airplane and all lives aboard.

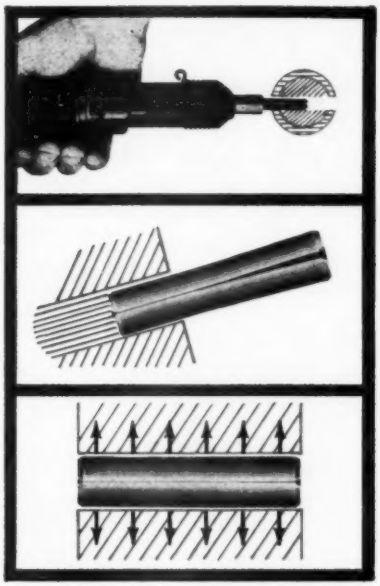
If any commercial manufacturer intent upon the production of bonded products were to inspect the Monrovia Aviation shops and study the techniques employed, he would leave convinced of this fact: While proper equipment is necessary for successful metal bonding, used without proper controls and background knowledge, this equipment would be pretty much like an airplane without a pilot. •

Rollpin won't mushroom or telescope

There are no installation or removal problems with Rollpins. Because of their column strength they can be readily driven with a hammer, removed with a punch without bending or collapsing. Of course production line tooling such as an arbor press, a pneumatic hammer . . . even a hand riveter . . . is ideal for Rollpin insertion.

Rollpin won't damage or enlarge hole

With smoothly chamfered ends providing an easy lead-in, Rollpin is compressed into complete conformity with the shape of the hole. The exclusive, v-shaped, coped corner design eliminates possibility of damage to the hole walls. They prevent any possible scoring action as the pin is driven and insures uniform insertion and removal characteristics. The benefit to you: the same pin can be reused in the same hole.



ONLY ROLLPIN OVERCOMES ALL THESE FASTENING PROBLEMS!

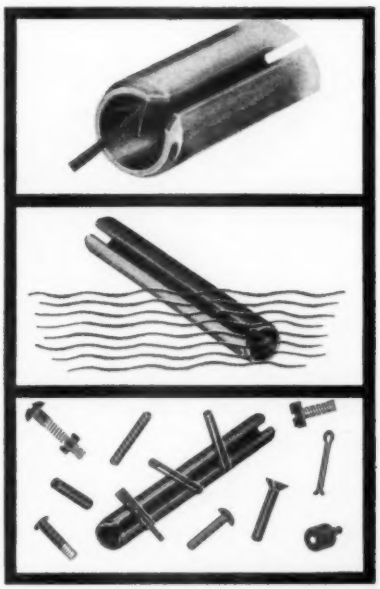
Rollpin exerts EVEN pressure

In some fasteners, only a portion of the fastener shaft does the actual holding. Rollpin, however, exerts a uniform pressure around the entire inside surface of the hole—giving you maximum holding power and superior resistance to vibration.

Split tubular construction assures uniformity of heat treatment that is difficult to obtain with spiral types of pins; there is an even plating "throw" inside the pin as well as outside — for superior corrosion protection; there are no thin edges susceptible to damage.

ONE TYPE of Rollpin does EVERY TYPE of job

Versatile Rollpins will replace at least 12 different types of fasteners. Every Rollpin can be hopper-fed, can be installed with a single operation. They are available, from stock, in a wide range of lengths and in diameters from 1/16" to 1/2". Manufactured from carbon or corrosion resistant steels and beryllium copper.



ROLLPIN®

ELASTIC STOP NUT CORPORATION OF AMERICA

WHERE CAN YOU USE THIS VERSATILE FASTENER? MAIL COUPON FOR SAMPLES:

Dept. R59-497 Elastic Stop Nut Corporation of America

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WHY TIGHTEN A BOLT

by **Francis R. Kull**
Engineer, Special Assignments
Standard Pressed Steel Company

Why is it so important to tighten a bolt? Failure to tighten screws and bolts and keep them tight causes more than 90 per cent of threaded fastener failures. Failures can result in costly machine downtime and repairs, and can also cause bodily injury and loss of life. What causes these failures? Fatigue! Fatigue is not always the result of a faulty bolt or unsound design. It can be the direct result of poor application techniques and improper control.

Fatigue is the result of repeated stressing of a part, a variation of load such as vibration or shock that causes failure at stresses far below the yield strength of the material. Eventually, little loads can cause failure of very strong bolts.

The remedy, then, is to cut down on the amount of the dynamic and repeating load the bolt has to carry, which will greatly reduce the likelihood of fatigue failure. This is done by preloading or tightening the bolt. The higher the preloading, the lower the fatigue inducing effect of the dynamic load.

Preloading a bolt, as we have said, is a matter of tightening the bolt. When the bolt is tightened in an assembly, the part or parts of the machine that are being held by the bolt are clamped together. The holding-together force depends on how tightly the nut or bolt is wrenched. It's like binding your hands together with rubber bands.

The more rubber bands you use, the greater the holding-together effect. The rubber bands act like a bolt that is preloaded. The force built up by stretching and wrapping a number of bands can build up a considerable force. Now, suppose you wish to separate your hands. You must be strong enough to exceed the force of the bands before you can separate them. If you cannot exceed the force, your hands will stay together.

Suppose a bolt is tightened and it has a holding-together force of 5,000 pounds. If the parts the bolt holds together do not have a pushing apart force of more than 5,000 pounds, the parts will stay together. This is just like the hands and rubber band example. The interesting part of this situation is that because the holding together force is greater than the pushing apart force, the bolt will not fatigue, as it will not feel the effect of the working load. If the bolt is left loose, it will feel the full effect of the pushing apart force and more likely will fail.

Self-locking nuts and fasteners with supplementary locking devices such as nylon in the screw thread, are helpful in preventing loosening under conditions of excessive vibration. It must be understood however, that proper tightening is of prime importance in any application, and these products add to the locking effect developed by proper tightening. •

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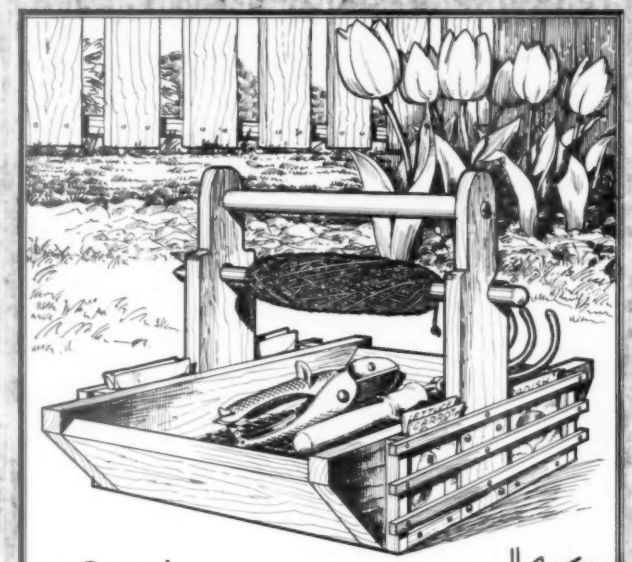
ROCKFORD SCREW PRODUCTS CO.
Rockford, Illinois

Hobby-nearing with "ROCKFORD" Screw Products

"ROCKFORD" HOME WORKSHOP PROJECT of the MONTH



Garden Tool Tray

A. ACER 62

Hobby-nearing with "ROCKFORD" Screw Products

ROCKFORD, ILLINOIS

ORIGINAL DESIGNS

APRIL 1960

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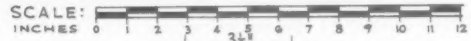
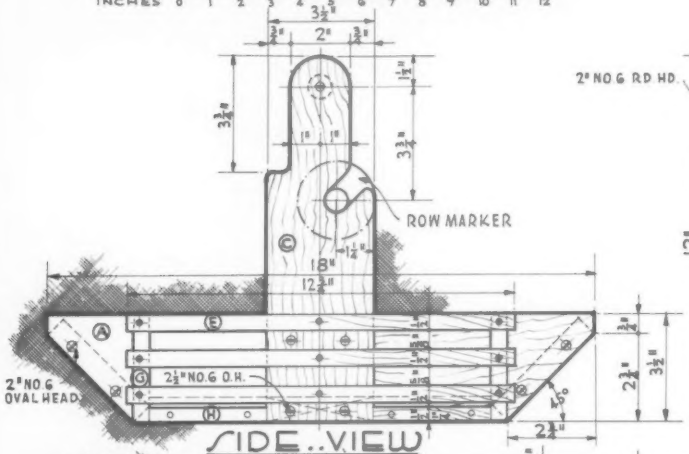
Hobby-nuring with ROCKFORD Screw Products

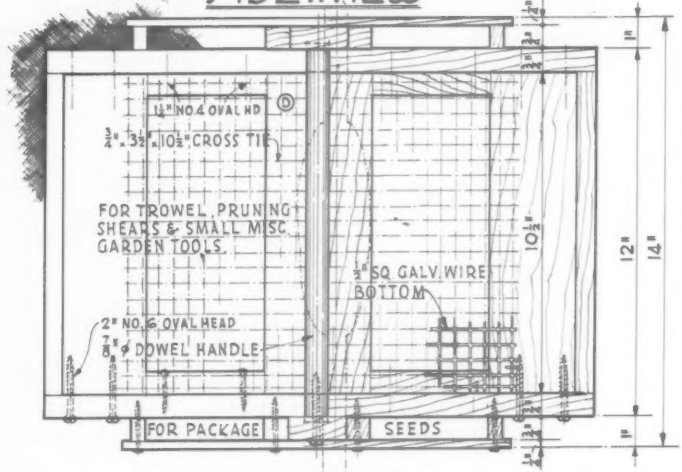
"ROCKFORD" HOME WORKSHOP PROJECT of the MONTH

Garden .. Tool .. Tray

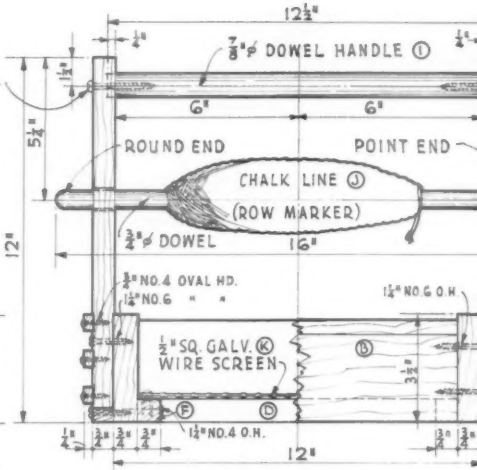




SIDE .. VIEW


1½" NO.4 OVAL HD
¾" x 3½" x 10½" CROSS TIE
FOR TROWEL, PRUNING SHEARS & SMALL MISC. GARDEN TOOLS.
½" SQ. GALV. WIRE BOTTOM
2" NO.6 OVAL HEAD
⅞" ø DOWEL HANDLE
FOR PACKAGE
SEEDS

TOP .. VIEW



END .. VIEW

BILL .. OF .. MATERIALS

2 PCS.	¾" x 3½" x 18" .. SIDES	Ⓐ
2 "	¾" x 4" x 10½" .. ENDS	Ⓑ
2 "	¾" x 3½" x 12" .. UPRIGHTS	Ⓒ
1 "	¾" x 3½" x 10½" .. CROSS TIE	Ⓓ
6 PCS.	½" x ½" x 12½" .. SIDE RAILS	Ⓔ
4 "	¾" x ¾" x 3½" .. SCREEN CLEATS	Ⓕ
4 "	¾" x ½" x 3½" .. RAIL ENDS	Ⓖ
4 "	¾" x ¾" x 3½" .. BOTTOM CLEATS	Ⓗ
1 PC.	⅞" ø x 12½" .. DOWEL HANDLE	Ⓘ
1 "	¾" ø x 16" .. " FOR CHALK LINE	Ⓙ
1 "	13" x 10½" .. ½" ø GALV. WIRE SCREEN	Ⓚ

"ROCKFORD" WOOD SCREWS

2	2" NO.6 RD HEAD	12	1¼" NO.4 OVAL HEAD
4	1½" NO.6 OVAL "	8	1¼" NO.4 " "
4	2½" NO.6 " "	6	¾" NO.4 " "
8	2" NO.6 " "		

12-18-51

HAGER DESIGN ST

Spring is in the Air..

NO DOUBT YOU ARE WORKING OVERTIME IN AN EFFORT TO COMPLETE THE PROJECT WE FEATURED LAST MONTH.

- TO MAKE IT EASY ON YOU I HAVE DESIGNED A SIMPLE PROJECT FOR THIS MONTH. MIND YOU IT'S A VERY USEFUL ITEM FOR YOU GARDEN MAKERS.
- PROJECT NO 1 WILL SIMPLIFY THE LAYING OUT & PLANTING OF YOUR GARDEN. IT CONVENIENTLY HOLDS SMALL TOOLS THAT ARE EASILY LOST IN GARDEN MAKING.. NOTE THE SCREEN BOTTOM THAT PREVENTS THE ACCUMULATION OF DIRT IN THE TRAY.
- THE RACKS ON THE SIDE ARE HANDY FOR PACKAGED SEEDS & PLANTING INSTRUCTIONS. TO LAY OUT & PLANT STRAIGHT ROWS. A STAKE & CHALK LINE IS PROVIDED. KNOTS TIED IN LINE FOR DISTANCE BETWEEN ROWS AID IN UNIFORM ROW SPACING. STRETCHING LINE ALONG ROWS ACTS AS GUIDE FOR PLANTING.
- THE GARDEN TRAY CAN ALSO BE USED TO CARRY CUT FLOWERS, PLANTS OR BULBS.
- IN MAKING THE TRAY, WHITE PINE, RED CEDAR, REDWOOD OR CYPRESS CAN BE USED. PAINT IT IN BRIGHT COLORS OR STAIN FOR RUSTIC EFFECT.
- IF PAINTED USE BRIGHT STEEL WOOD SCREWS. IF STAINED, CADMIUM PLATED OR BRASS SCREWS ARE RECOMMENDED
- MY BEST WISHES FOR A FLOURISHING GARDEN

Herm.

"Hobby-neering"®

SERIES.. NO. 10

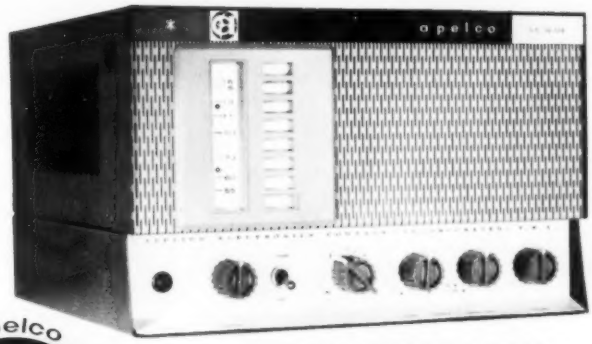
PROJECT 1

Designed by A. ACER OF ROCKFORD

USE FOR COMMERCIAL PURPOSES IS STRICTLY FORBIDDEN

N STUDIO

★ HERE THERE AND EVERYWHERE with "ROCKFORD" Screws and Bolts ★



apelco

SHIP TO SHORE RADIO

Manufactured By:
APPLIED ELECTRONICS CO. INC.
SAN FRANCISCO, CALIFORNIA

No. 4612
CHAIR

Solid
Genuine
Mahogany

Fruitwood
Finish.

Manufactured By:
STATESVILLE
CHAIR
COMPANY
STATESVILLE, NORTH CAROLINA

☆ COULD BE ☆

Oomph!!

"Rockford Screws" weren't available when this old relic was made.

Yes, it was difficult in the days when those fine old pieces of Furniture were made, that the Wood Screws then made, if any, were of inferior quality because equipment and specific materials were unknown. Modern developments and techniques have come a long way to assure furniture manufacturers of better screws at less cost and more economical assembly operations.

So today, Fine Furniture has all these advantages of modern production available and a great selection of Wood Screws and allied fasteners at its command. "Rockford" Quality Controlled Screws and Bolts are preferred by most well known names in the vast Furniture Industry because Quality and Service Plus have always been our bywords.

"The Best to You . . . from Rockford Screw"

Garden Tool Tray

Hobby-neering with "ROCKFORD" Screw Products

ROCKFORD,

ORIGINAL DESIG

APRIL 196

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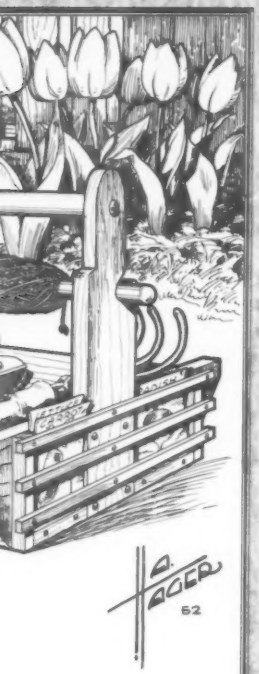

52

ILLINOIS

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"ROCKFORD"®
Screw Products Co.
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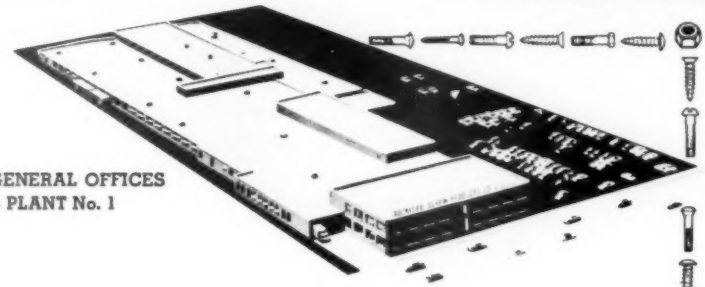
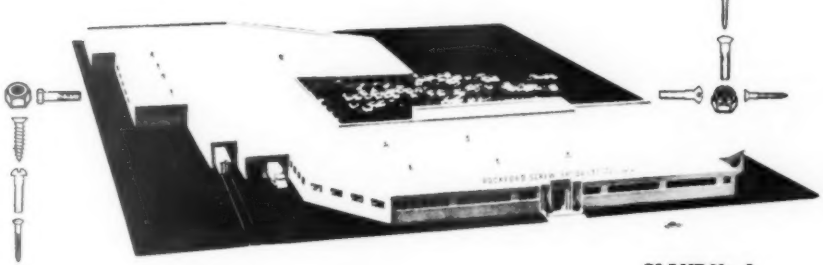
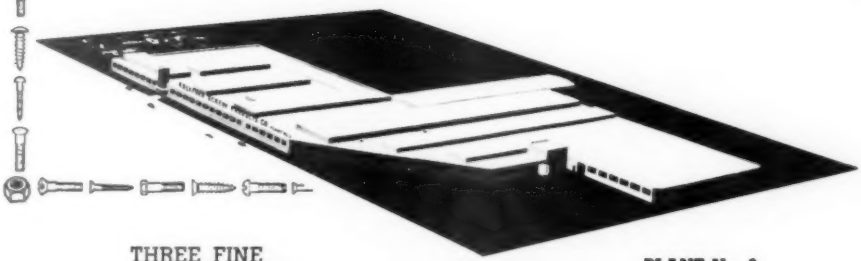


GENERAL OFFICES
& PLANT No. 1



PLANT No. 2



PLANT No. 3

THREE FINE
MODERN PLANTS
PRODUCING *"ROCKFORD"* QUALITY CONTROLLED
THREADED FASTENERS FOR AMERICAN INDUSTRIES.

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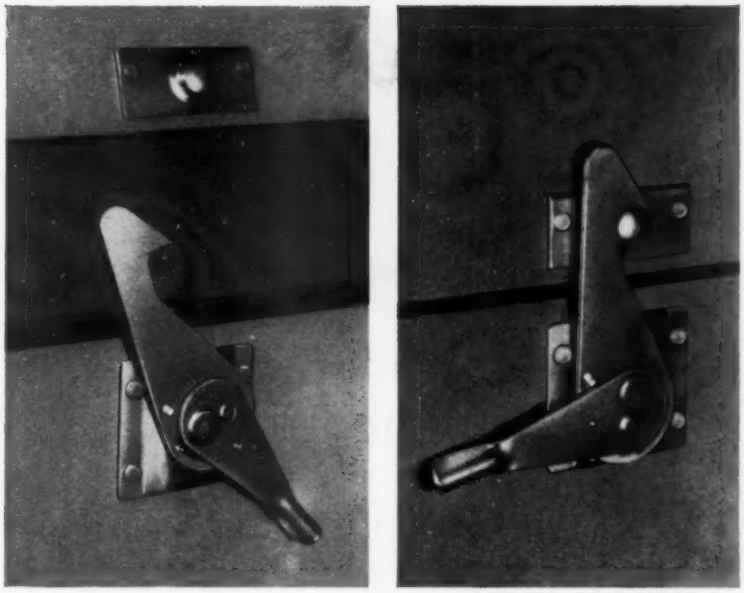
ROCKFORD SCREW PRODUCTS CO.

"ROCKFORD"

HOME WORKSHOP
PROJECT of the

WHAT HOOK-LOCK IS

HOOK-LOCK is a springless, positive-locking latching device which is ideally suited for use on rigidly specified military transit cases as well as less expensive commercial containers. It provides high closing pressure and tremendous load-carrying capacity...is impact and shock-proof. HOOK-LOCK is so designed that it lies flat against the mounting surface whether in open or closed position. Since operation is parallel to mounting surface, no space for operating clearance is required.

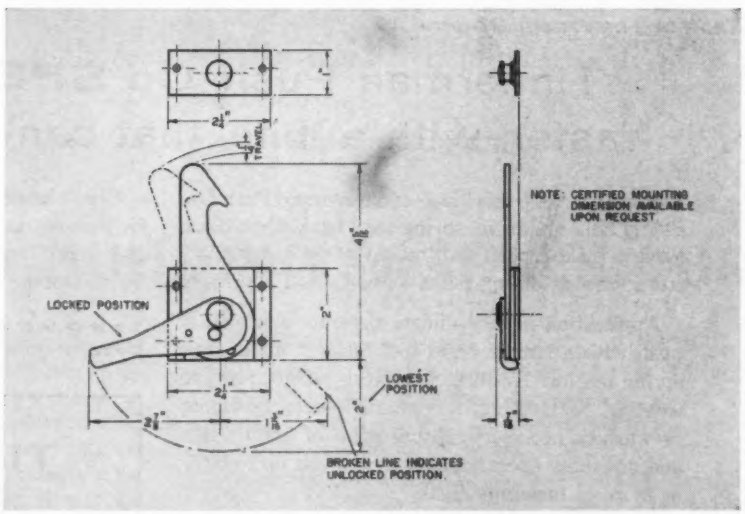


HOOK-LOCK lies flat against mounting surface, open or closed.

New—HOOK-LOCK container latch...It's flat!

FEATURES

- Shock-proof—solid construction...withstands high impact blows *directly on the fastener.*
- Closing pressure of 200 lb. Where needed, pull-down pressure can be substantially increased by modification of operating lever.
- Tensile load capacity: 750 lb.
- Compact—lies flat open or closed. Extends just 7/16" from container surface at thickest point.
- Positive-locking and springless. Unaffected by arctic temperatures.
- No operating clearance required, because hook and lever move parallel to mounting surface.



IF YOU have questions regarding the possible application of HOOK-LOCK or other Simmons industrial fasteners to your particular needs, your inquiry will receive our immediate attention. Contact your nearest Simmons office or write direct.

SIMMONS FASTENER CORPORATION

1796 North Broadway, Albany 1, New York

See our 8-page catalog in Sweet's Product Design File

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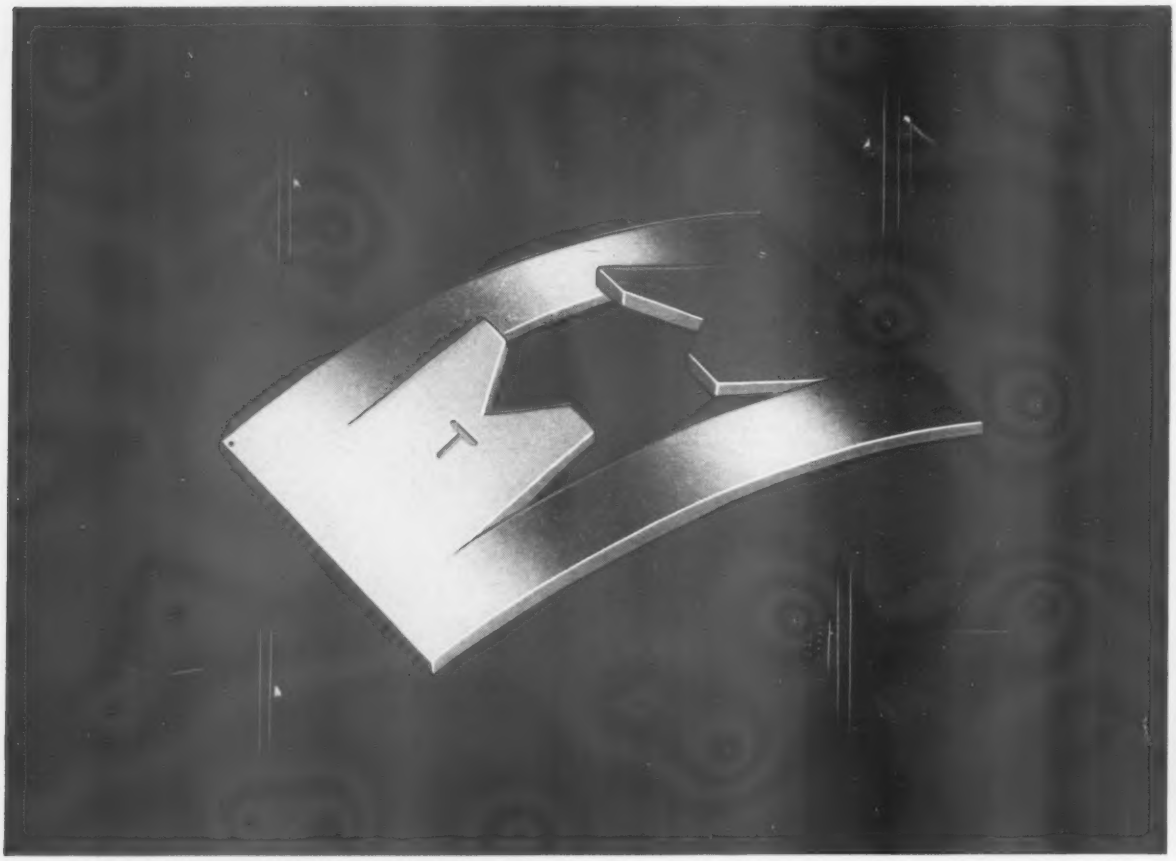

Another Tinnerman Original...

Tinnerman Push-On **SPEED NUTS**® fasten with a "bite" that can't shake loose

In a split-second, this low-cost Tinnerman Push-On SPEED NUT arches its spring-steel back, then bites hard to make a positive attachment on unthreaded studs, rivets, tubing, nails, jewels, small housings.

Application is easy—finger pressure starts it; a push with a simple hand tool locks it under live spring tension. No threads to worry about, no spot welding, no riveting, no special inserts, bushings or washers necessary. Elimination of extra parts and assembly operations may save you up to 50% or more in fastening costs.

Push-On SPEED NUTS lock on everything from thermoplastics to die-cast, chrome-plated steel. Hundreds of variations to fit any shape or size stud —from very small diameters to larger rectangular shapes. Some Push-Ons have "caps" that cover exposed shaft, axle or stud ends.

Check Sweet's Product Design File, section 8-T. Or look under "Fasteners" in the Yellow Pages and call your Tinnerman representative for complete information and samples. Or write to:

TINNERMAN PRODUCTS, INC.
Dept. 12 • P. O. Box 6688 • Cleveland 1, Ohio

TINNERMAN
Speed Nuts®

FASTEST THING IN FASTENINGS®

CANADA: Dominion Fasteners Ltd., Hamilton, Ontario. GREAT BRITAIN: Simmonds Aerocessories Ltd., Treforest, Wales. FRANCE: Simmonds S. A., 3 rue Salomon de Rothschild, Suresnes (Seine). GERMANY: Mecano-Bundy GmbH, Heidelberg.

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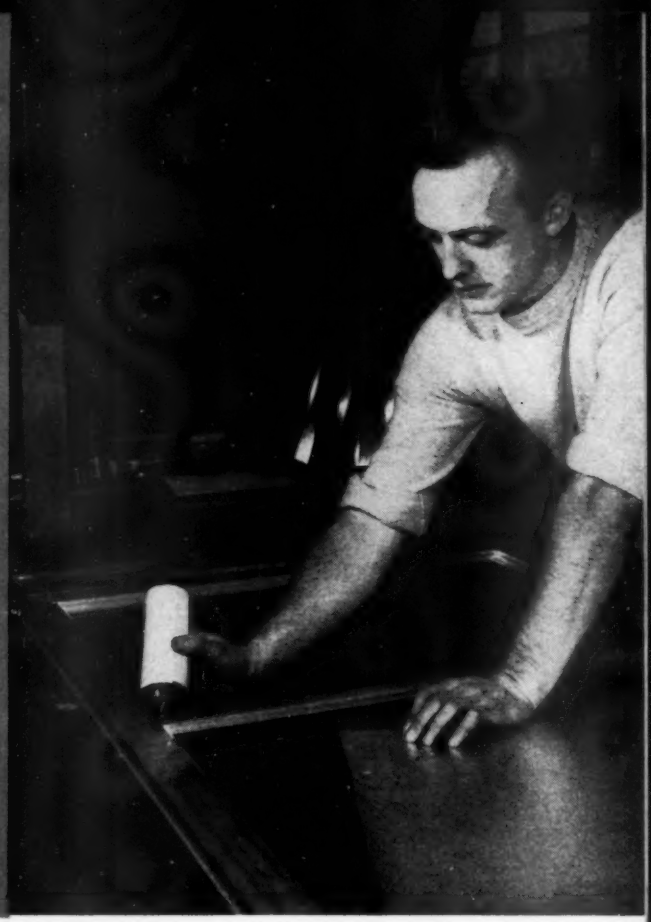
Adhesive is applied to a mullion bar and the inside door hollow. Note the metal kick panel ready for insertion.

Blind rivets are being installed through the corner gussets of aluminum doors.



A small manufacturer discovers that blind riveting and adhesive bonding can cut costs, improve product durability.

RIVETING AND BONDING SASH & DOOR

The manufacture of aluminum storm doors and windows is one industry which owes much of its growth to the building and construction boom of the past 15 years. But competition is fierce and, according to one manufacturer, success is getting harder to come by. Careful controls, therefore, must be exercised on all cost factors. At least this is the analysis offered by General Aluminum Company of Woburn, Mass.

Discussing this, Arthur Cunningham, plant manager, says, "The raw materials we use are metal and glass. Costs are pretty well fixed, and so we have devoted considerable time and effort to come up with the best methods for fastening and assembling the doors and windows. Fortunately we discovered blind riveting and a particularly effective adhesive, which have helped us reduce costs and improve the durability of our products."

The rivets were originally developed for the aircraft industry. Once holes are drilled through parts to be assembled, a single workman can insert the rivets and set them without any necessity for access to the other side of the work.

One such use of Pop rivets at General Aluminum is for holding hinges onto the Z bars of door jambs. Only seven rivets are necessary to provide permanent fastening of each standard size unit. A hydraulic gun sets the seven rivets in seconds.

A second application of the rivets is in the joining of the four corners of the door. The rivets, again with a hydraulic gun, are set through the corner gussets of the door by a single operator. Four rivets are set in each corner, two to each side. Well-mitered, completely flush corners are the result. Formerly screws were used. In addition to being a slower

continued

fastening procedure, the screws were subject to vibration brought on by repeated openings and closings. Eventually they would loosen to produce a gap in the corners.

"We estimate a 30 percent savings in our assembly costs, a result of rivet applications," states Cunningham.

For the insertion of glass panels into the doors, a Bostik adhesive has simplifed glass cutting and the final insertion of the glass panels. Using a plastic squeeze-type container, a workman at General Aluminum applies the adhesive to the window inserts before fitting the glass into one corner. The tacking is such that he is able to cut the glass to size without delay.

In much the same manner, kick panels are set into the bottoms of storm doors. For this application, a movable mullion bar and the inside door hollows are coated with the adhesive. The aluminum panel, cut to size, is then fitted in and held in place. A caulking compound formerly used for this purpose proved completely unsatisfactory and at times resulted in the drop-out of the panel after use.

"With job-shop type of production, and demand for our products being seasonal, we've found these efficient assembly methods especially important," said Cunningham, whose firm recently expanded into a new plant. •

Tips to help you cut impact socket breakage

- Position power wrench so that socket fits straight on nut. Tilted wrench causes binding and socket breakage.
- Use right size socket . . . replace worn or undersize nuts. Loose-fitting sockets wear faster — then break.
- Don't keep impacting after nut is tightly set. This causes needless wear on both wrench and socket.
- Keep the inside of sockets clean. Dirt and grease are common causes of socket breakage.
- When power wrench drive head becomes worn — replace it. Loose drive causes excess wear in socket drive opening — early socket breakage.

Best tip yet!

ALWAYS USE *Snap-on* INDUSTRIAL SOCKETS

Sockets used on power nut runners and impact wrenches take a terrific pounding. Standard hand-wrench sockets are not designed for this work. *Snap-on* heavy-duty industrial sockets have the extra heft and toughness to take the beating. Result: more work-hours per socket and, equally important, less costly downtime resulting from frequent breakage of ordinary sockets.

Final tip. Talk sockets with your *Snap-on* man. Take advantage of his specialized tool knowledge, and his competent advice on what is best for you in the wide range of *Snap-on* industrial sockets. Your nearby *Snap-on* branch office provides prompt emergency or regular service.

FOR ALL INDUSTRY

SNAP-ON TOOLS

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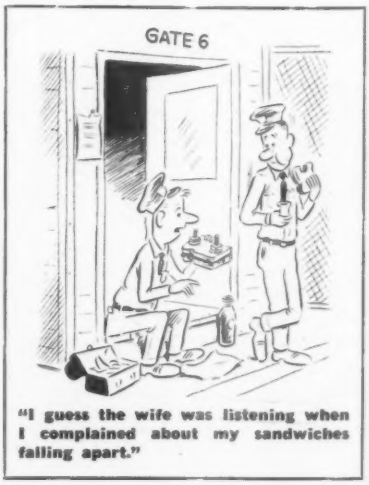


"I guess the wife was listening when I complained about my sandwiches falling apart."

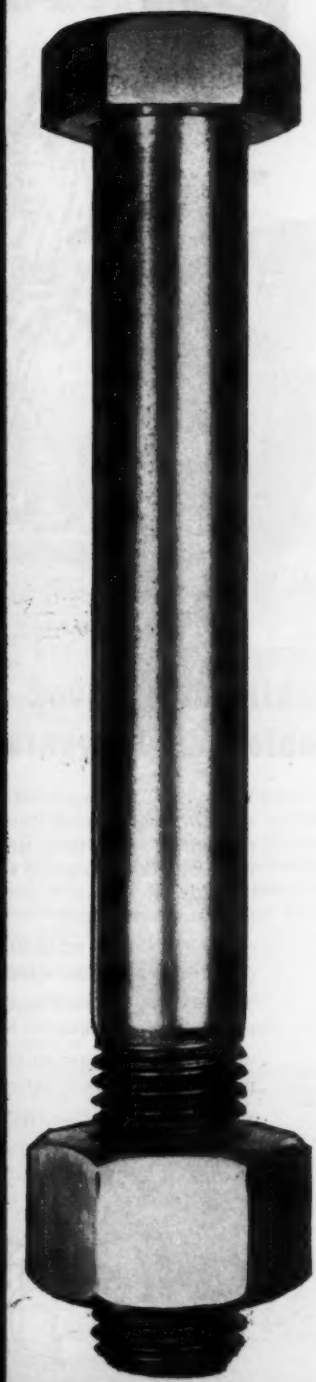
WATERBURY FARREL

MACHINERY BUILDERS

BUILDS A WIDE RANGE OF

COLD HEADING MACHINERY*

for high speed, scrapless forming of metal parts



*includes: cold headers (single or double blow) progressive headers, nut formers, parts formers, thread rollers, slotters, trimmers, and pointers; also special purpose headers and auxiliary equipment

THE WATERBURY FARREL FOUNDRY & MACHINE CO.

Waterbury, Connecticut, U.S.A.

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Archimedes solved your fastener problem 2100 years ago...

When the Greek mathematicians developed the formulas for spiral forms, they set the ideal pattern for the SPIROL spring pin. Since the spiral configuration is a true spring, SPIROL's multiple coils provide these exclusive fastening advantages:

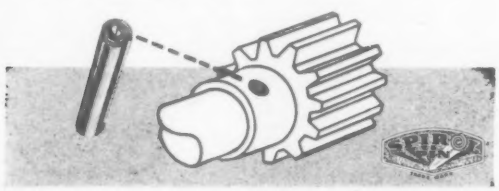
UNIFORM STRESS DISTRIBUTION throughout the coils — hence, no critical cross-section . . .

360° RADIAL TENSION absorbs shocks at any point — no weak axis . . .

WIDER HOLE TOLERANCES — both plus *and* minus — reduce drilling cost . . .

WIDER SIZE RANGE — from 1/32" to 3/4" diam.

FREE: *Write for illustrated brochure containing analysis of spring pin characteristics.*



C.E.M. COMPANY INC. • 36 SCHOOL ST. • DANIELSON, CONN.

SPIROL *the true spring* **PIN**

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A Report on Tooling For . . .

FEEDING EXTRUDED WASHERS TO ASSEMBLY MACHINE HEAD

Automatic feeding of small parts is the key to the economical operation of most assembly machines. However, there must be a complete integration of the mechanisms for feeding, escaping, placing, and sensing.

A good example of this is concerned with delivering an extruded washer to an assembly machine head, then placing the washer in the chuck for ramming it home in a cup. The washer is .455" in diameter and the cup provides only .001" clearance.

This particular problem was brought to the attention of engineers at Dixon Automatic Tool, Inc., who came up with an air-operated feeder which does not require a vibrator or a separate motor. Of special interest is the fact that the new feeder can be used with different makes and types of assembly and screwdriving machines.

Here is how it works. Lugs on the feeder drum pick up the washers from the hopper and deposit them upon a specially-formed loading or catch tray,

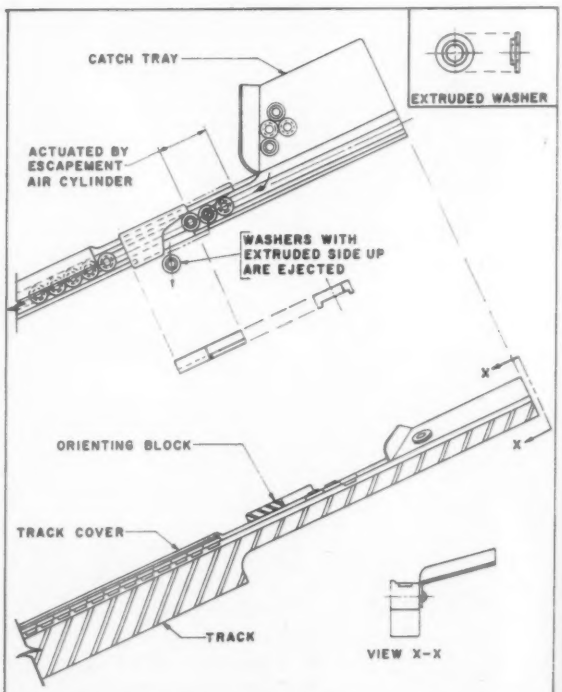
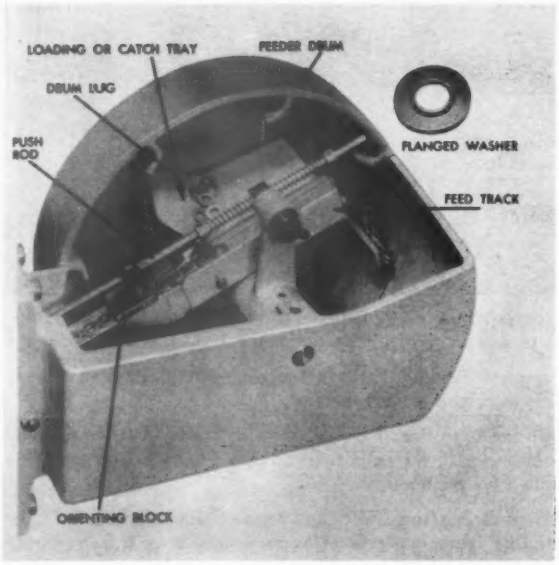


Diagram of the feed track which receives the formed washers. Note the orienting block which side-tracks any washers that may start down the track with the formed side up.

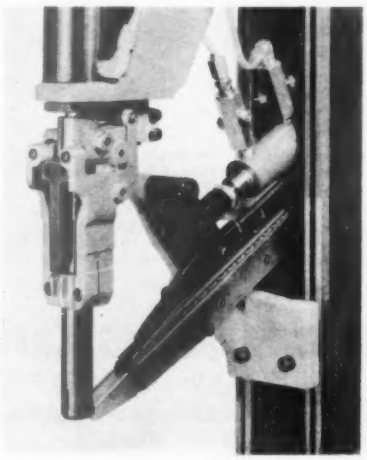


View of feeder hopper area showing the push-rod which is actuated by escapement air cylinder to rotate the drum and reciprocate the orienting block.

from where they slide onto the feed track. This action takes place as the drum is rotated intermittently by a double-acting air cylinder through a pair of wrap-spring clutches. The air cylinder also operates the shuttle-type escapment and the orienting block.

This block is of interest because of the way it rejects misoriented washers. In order for a washer to reach the chuck in the correct position, it must travel on the track with the extruded side down. In this position, the projecting flange fits into a groove in the track, permitting the washer to pass under the block. When the extruded side is up, the flange contacts the shaped edge of the block, and the washer is shunted back into the hopper as the block reciprocates on the track.

The feed track is straight and the escapement provides for positive placement of washer in the chuck. This permits low-angle trackmounting and assures parts control at point of escapement. •



Front end of feed track projecting from between the vertical members of automatic positioner. Note the shuttle-type escapement and its finger which puts washer in chuck.

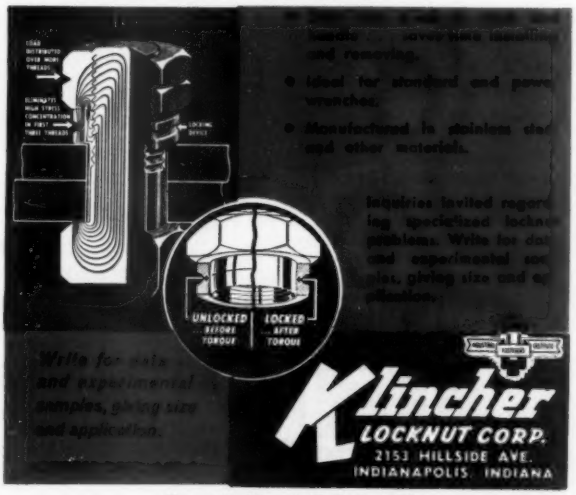
ENGINEERS ARE ALWAYS SPECIFYING –

Klincher LOCKNUTS

On more and more vital bolt connections on jet and conventional aircraft engines, race cars, Diesel engines, and equally stringent applications, Klincher Locknut is getting first call. Engineers recognize that Klincher design characteristics reduce high stress concentration and torsional load usually found in the first two or three threads. Load is distributed to more threads. Result: you take advantage of all the strength designed in your bolt, stud or axle shaft.

KLINCHER ADVANTAGES:

- Spins freely down to work. Stays positively locked.
- After breakaway, nut spins off freely, ready for reuse, without impairment of locking efficiency.



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IF EVER A BOLT CAME UP WITH THE ANSWERS— IT'S THIS ONE!

The Lamson High Strength **Bearing Bolt** is solving some of the oldest, meanest and costliest problems ever presented by steel connections.

Recent highly successful applications include: steel mill buildings and cranes, railroad bridges, dragline buckets, construction machinery, radar antennas.

THE BASIC ADVANTAGES ARE BIG ONES:

1. High Strength Bearing Bolts combine the tensile strength of High Strength Bolts with the bearing properties of rivets.
2. High Strength Bearing Bolts have the highest shear strength and greatest resistance to slip of all structural fasteners.
3. High Strength Bearing Bolts make possible important labor savings in fabrication and erection.
4. The High Strength Bearing Bolt assembly (bolt, nut, one washer) costs no more, grip for grip, than a High Strength Bolt assembly (bolt, nut, two washers).
5. High Strength Bearing Bolts (and Lamson High Strength Bolts) are available from every Steel Service Center of U.S.S. Supply Division, United States Steel Corporation.
6. High Strength Bearing Bolts are produced by Lamson & Sessions, a "major" in the fastener industry and a prime producer of structural fasteners since the turn of the century.

FOR PRICE AND DELIVERY INFORMATION: Contact any Steel Service Center of United States Steel Supply.

FOR ENGINEERING BULLETIN AND SAMPLE: Write The Lamson & Sessions Company, 5000 Tiedeman Road, Cleveland 9, Ohio.

For easy driving, the knurls are ball-shaped in front, relieved in back, set in a spiral pattern. In most grips, bolt can be placed in hole, then pulled through connection with torques well below final assembly torque. One man can install—no need to hold the head.

LAMSON & SESSIONS

5000 TIEDEMAN ROAD · CLEVELAND 9, OHIO

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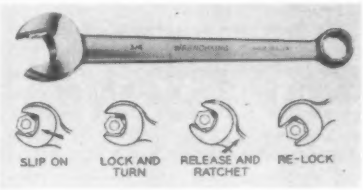
WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 74. Just circle the number on the card matching the number following the description. We'll do the rest.



(See 1)

OPEN-END RATCHET WRENCH WITH LOCKING GRIP

An open-end type wrench utilizes a pawl for increased speed and effectiveness.

The spring-activated pawl permits the user to slip the wrench on a nut in any position. Turning the wrench immediately locks it firmly against the nut. Because the grip is firmer, force is applied more evenly, with minimum damage to corners of a nut. Wrenchking's pawl also has a ratcheting action which permits faster, more sure tightening.

The Bristol Company, Socket Screw Division, Waterbury 20, Conn.

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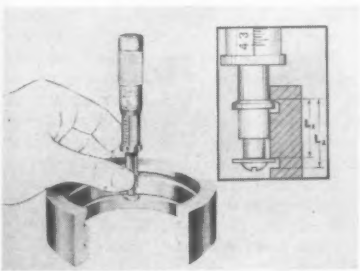

(See 5)

THREAD MILLING PLASTICS, METALS TO WITHIN .001"

A thread-milling machine has an almost limitless range for threading plastics and metal— internally or externally—including beryllium, titanium and stainless steel.

Pitch and root diameters, as well as pitch angle, are held to .001". Milling is completed with one pass on any 9" to 20" screw-cutting lathe.

Cutters are available for cutting any 60°, Acme, square thread or even multiple threads, from ½" to 9" for internal threading, and from 1/32" to 9" for external threading. Cutting capacity ranges from 4 to 200 threads per inch.

Fen-Thread-Machine Co., Inc., 3107 N. Broad St., Philadelphia, Pa.

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(See 4)

WEST GERMAN ELECTRON BEAM WELDING, MACHINING

An electron beam process for welding the hardest of metals or machining miniature electronic components has been developed by the Carl Zeiss Foundation of West Germany.

The welding machine handles stainless steel for aircraft missile structures, producing T sections .600" thick from sheet stock at a rate of two feet per minute. It will butt-weld ⅜" stainless steel at 1/3" per second and has welded through ½" of stainless steel without distortion and with minimum grain growth.

The equipment has been used to mill miniature electronic components, drilling jewel watch bearings with 90% efficiency.

Hamilton-Electrona, Inc., 40 Wall St., New York, New York.

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ELEVATING CONVEYOR FEEDS, ORIENTS VARIETY OF PARTS

An elevator feeds and orients parts of a variety of sizes, shapes and materials to processing or assembly machinery.

The elevating conveyor can effect discharge to the right or left at desired heights. The drive is either fixed or vaiable speed and can be equipped with automatic controls for demand feeding, feeder operating only when parts are needed.

Standard sizes are of 6, 12 and 20 cubic foot holding capacity.

Detroit Power Screwdriver Company, 2801 W. Fort St., Detroit 16, Mich.

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MICROMETER GAGE LOCATES RETAINING RING GROOVES

A micrometer gage provides an accurate, economical means for locating beveled and rectangular grooves.

The Truarc tool is designed to measure the distance from the outer wall of a beveled or rectangular retaining ring groove to a plane of reference located 0.4" to 1.4" from the groove wall. The gage may be used also for measuring the location of O-ring grooves, rectangular oil grooves, thread reliefs and other internal recesses in bores and housings and external grooves on shafts and similar parts. The tool will accommodate grooves in housings or shafts 1.5" in diameter or larger.

A special removable flange may be

SEELSKREWS®
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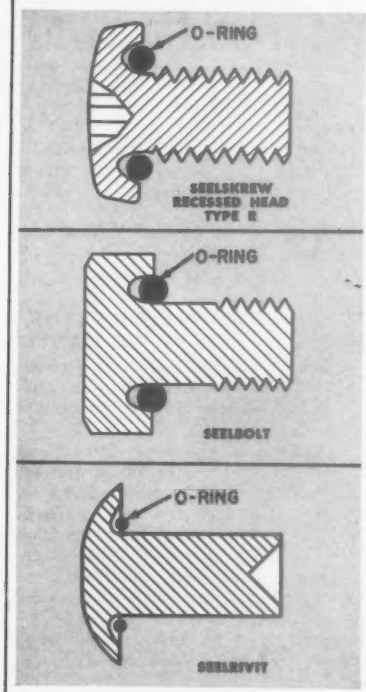
High Pressure Self-Sealing
FASTENERS



- Removable and static self-sealing screws, bolts and rivets.
- These industrial fasteners meet all applicable military specifications.

SEND FOR CATALOG 359-A-6 *describing items above, also seals for switches, shafts, circuit breakers, indicator lights and other electronic components.*

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affixed to the spindle to provide an artifical reference shoulder where none exists in the part being checked. The flange is especially useful for measuring distances between two grooves and may be employed also to measure groove width.

Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.

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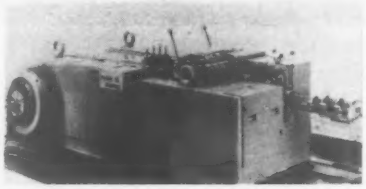
FIVE STAGE COLD HEADER OF GERMAN DESIGN



A multi-stage cold transfer header is designed for the production of high-tensile screws, bolts and other complicated shaped parts. A separate similar machine manufactures nuts.

The German-made Malmedie units come with one shearing and four forming stages. Automatic feed indexing provides uniform blanks irrespective of timing. The machines are used with pre-assembled tool sets on swivel-mounted feed slides reducing setup time.

Straus-Artys Corp., 45 N. Station Plaza, Great Neck, N.Y.

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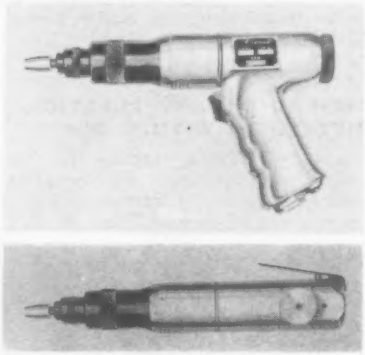
DEVELOP PORTABLE AIR NUTSETTER LINE



Pneumatic nutsetters are available in both reversible and non-reversible types in pistol and straight grips.

The Model 400-N non-reversible nutsetter is a straight type with a lever throttle. It is available in any of four operating speeds with a choice of an adjustable or positive clutch or direct drive. The 400-NP is equipped with a pistol-type grip and trigger throttle.

A straight design reversible nutsetter is recommended for applications where work space is limited. The model 400-RN has a lever throttle. The 400-RNP is produced as a pistol-type tool with trigger throttle. The cap reverse operates with a flick of the thumb to change directions of the socket.

Airetool Mfg. Co., 328 S. Center St., Springfield, Ohio.

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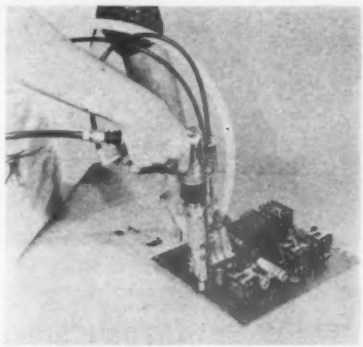
AIR SCREWDRIVER HANDLES 30 TO 60 SCREWS PER MINUTE



The Powasert Model B screwdriver will automatically feed, position, and drive from 30 to 60 screws per minute at torques of 3.6 to 6.3 ft.-lbs. At full speed, air consumption is an economical 11 cu. ft. per minute at 90 psi. pressure.

The new model consists of a 4-lb. pistol-grip or straight handle gun and a separate feeder-separator unit that holds 10 lbs. of screws. With the nose in contact with work, light pressure on the work surface feeds and drives each screw automatically. A fast, rotating separator gate and two-step elevator lifts provide positive one-screw control. Each screw is driven home before the next can be fed to the gun, and an improved feeder-separator mechanism entirely eliminates double-screw feeding and jamming.

All wood, sheet metal and machine screws from ½ to 1¾ inch in gauges 6 through 10 can be handled regardless of the type of head. As many as 26 different sizes and types of screws can be automatically fed and driven without change of fittings. Fitting changes for the entire range of screws can be made by the operator.

United Shoe Machinery Corp., 140 Federal St., Boston 7, Mass.

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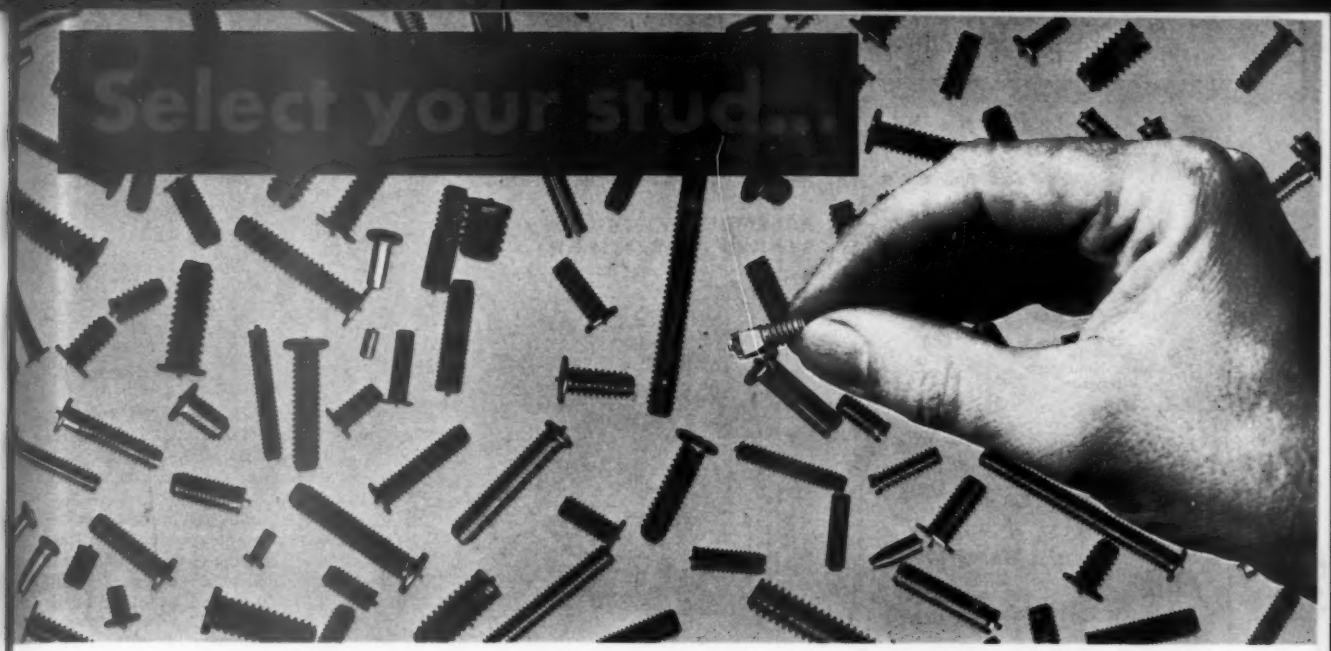
PNEUMATIC C-CLAMPS FOR HEAVY DUTY, MEDIUM JOBS

Two lines of air-operated C-clamps have been developed—a heavy-duty series for strength and durability and an economy series for average applications.

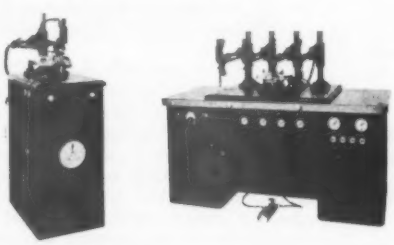
The clamps can be purchased with a manual sleeve valve or with an integral solenoid valve for automation applications. Various power factors are available. All clamps are available with a number of optional clamping ends.

The clamp pictured has a zero to six-inch adjustable opening with a depth of 3¼" and the cylinder has a 7:1 power factor. Other clamps in the



...and *OMARK®-GRAHAM®* stud welding system will increase speed, lower costs of your fastenings

Whether it's a tiny stud to be fastened to aluminum hearing aid-eyeglasses or a sturdy, specially-designed functional part for an automatic transmission, there's an OMARK-GRAHAM stud and welder to do the job.



Two of the models of OMARK-GRAHAM stud welders available for production line welding without burn-through or distortion.

Weld To Many Metals Without Burn-Through Or Distortion

You can lower your fastening costs and speed up production of metal fabrication with OMARK-GRAHAM stud welding system. Fasten studs of any design to steel, stainless steel, copper, aluminum or zinc.

The OMARK-GRAHAM stud welding system can be used on finished products without harming the finished side whether it is plated, painted or plastic coated. This fastening method is being used by manufacturers in every branch of industry: aircraft, electronics, household goods and automotive. Saves money in design and production; can replace forming, casting, soldering, brazing operations.

Investigate this product-improving, cost-lowering fastening method now. Our sales and engineering departments will help you work out the details that will save you money.

Wide Range Of Standard And Custom-Designed Welders And Studs

Whatever your fastening requirements, OMARK-GRAHAM offers a machine and studs that will do the job. Machines can be automatic or manually operated; single welding gun or multiple. Studs can be made from many types of metal in many shapes or sizes.

For More Information, Write, Wire or Telephone:

OMARK Industries, Inc.

1015 Reading Road, Cincinnati 41, Ohio, PRinceton 1-3131.

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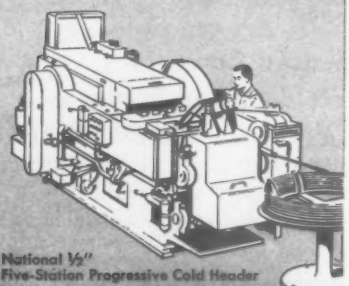
The top three are formed with no scrap loss, ready to use! All six achieve remarkable savings over past methods.

If you make odd-shaped parts, may we help you evaluate them for cold-forming from wire? Better yet, come to Tiffin, witness our demonstrations and let's discuss your work.



National ½" Five-Station Progressive Cold Header

NATIONAL MACHINERY CO.

TIFFIN, OHIO, U.S.A.

HARTFORD DETROIT CHICAGO

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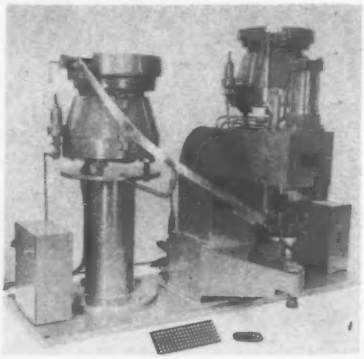
line have maximum openings of 7", 8", and 9".

Airmatic Valve, Inc., 7313 Associate Ave., Cleveland 9, Ohio.

Use postpaid card. Circle No. 9

ASSEMBLY MACHINE FEEDS, STAKES PLASTIC PART



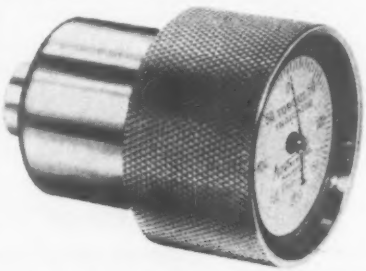
A preassembly, inserting and staking machine feeds a plastic insulator body from a feeder bowl into a small rotary assembly dial which is indexed to a position where a terminal post is escaped and pressed into the plastic insulator body. The assembly continues to index to the staking position where a small spring loaded collet picks up the assembly and carries it vertically downward and inserts it in a hole in a panel or chassis positioned just below.

A punch located within the collet serves to seat the assembly and compress the spring loaded anvil which bottoms, staking the entire assembly firmly in place. Variations in design and part handling sizes are available on special order.

Automation Development Corp., 135 Reynolds Rd., Mentor, Ohio.

Use postpaid card. Circle No. 10

DIRECT READING TORQUE GAGE IN FOUR RANGES



A direct reading torque gage is accurate within 2% in four basic in.-oz. ranges: 1-15, 2-50, 2-150, 2-200.

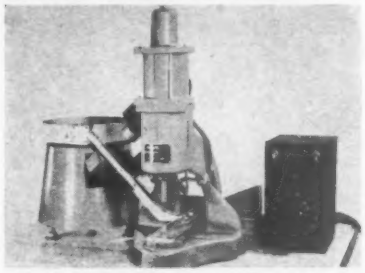
In assembly operations, the indicator dial face is set to predetermined torque reading and the fastener tightened until the dial reads zero. It is also a spring adjustment tool.

One degree rotation of indicator will give a full scale reading. A range of adapters is available.

Autotronics Inc., Route 1, Box 812, Florissant, Missouri.

Use postpaid card. Circle No. 11

IMPROVED STAKER SETS WIDER TERMINAL RANGE



A wider range of terminals can be set with an improved model (FST-1) Electroset. These include split lugs and feed-throughs as well as single end terminals.

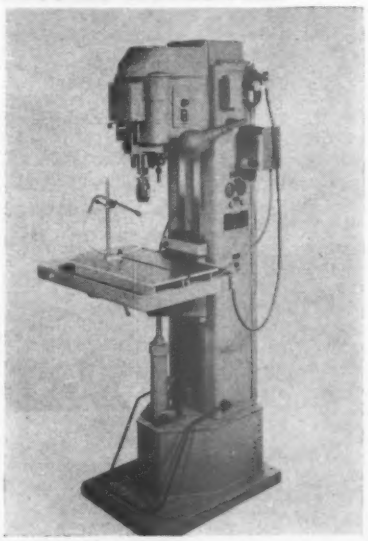
Up to 100 terminals per minute can be set, although ultimate production rates will depend on the arrangement of holes in the board and operator skill. Rates of 40 to 60 per minute have been reported.

The machine consists of an Electropunch and vibratory feeder, orienting devices, trackage, electrical controls and power feed. Impact is up to 3500 lbs.; stroke length, 1⅝"; throat depth, 4½"; and width of board, 9".

Black & Webster, Inc., 570 Pleasant St., Watertown 72, Mass.

Use postpaid card. Circle No. 12

VERTICAL DRILLING UNIT ASSURES STEADY FEED



A vertical drilling machine with infinite hydraulic feed control in conjunction with air feed is adjustable for the amount of feed required and assures steady feed on interrupted cuts or break-through.

The No. 3 machine has a drilling capacity of 3/16" to 5/8" in alloy steel. The work table is automatically positioned by air for quick change of tools and fixtures. Two ranges of spindle speeds (with eight speed changes in each range) cover from 300 to 1800 rpm. Solenoid units built into the machine synchronize clamping and index-

essential parts...

of your production program must not fail!

- THREAD CUTTING SCREWS
- SEMS (screw & washer assemblies)
- WELDING SCREWS
- SELF TAPPING SCREWS
- PHILLIPS (recessed head) SCREWS
- DRIVE SCREWS
- SPECIALS are our specialty

Every engineer and business man knows the consequences of assembly line slowdown or decrease of product quality. One of the most vital places to guard against these failures is in the fasteners used. Great Lakes' team of experienced engineers and craftsmen realize this and insist on the highest standard of quality in all Great Lakes' fastener products. To further insure this high standard—cold heading, heat treating, plating—yes, all operations are done within our completely equipped plant. Be safe—insist on Great Lakes quality!

GREAT LAKES SCREW CORPORATION

13631 SOUTH HALSTED STREET
CHICAGO 27, ILLINOIS
TELEPHONE: INTEROCEAN 8-9600

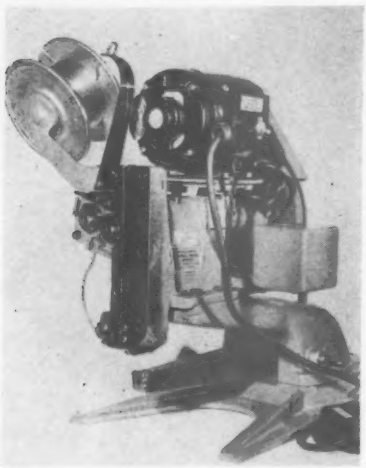
Use postpaid card. Circle No. 242

ing fixtures with spindle cycle.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Illinois.

Use postpaid card. Circle No. 13

PORTABLE WIRE STITCHER MAKES, INSERTS STAPLES



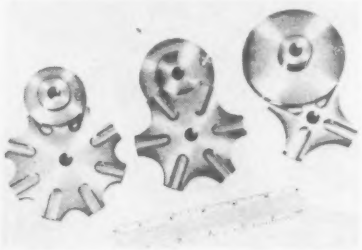
A portable wire stitching machine which makes and inserts staples from a coil of wire has been developed for fastening materials up to ⅜" thickness. This machine can "staple" through low-carbon steel, aluminum, plastics, wood and paper. The five pound coil of wire will make approximately 60,000 staples before reloading.

The machine can be actuated by either a foot switch or a micro-switch and is available with single-trip or multiple-trip clutch. The wire used is stocked in 28 different gauges of both round and flat, in standard finishes and colors.

General Staple Company, Dept. W, 28 E. 22nd St., New York 10, N.Y.

Use postpaid card. Circle No. 14

MINIATURE GENEVA DRIVES ARE STANDARDIZED



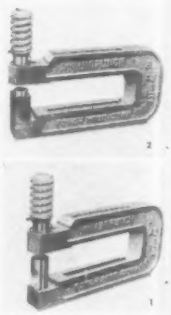
Exclusive feature of a line of standard miniature geneva drives is the miniature cam follower bearing used as the driving roller.

Micro-Geneva drives are offered with shaft sizes from .250" diameter to .500" diameter by 1/16" increments. The drives are available from stock in 4, 6 and 8 point drives with driver to wheel center distances from .750" to 2" by ⅛" increments.

Miniature Mechanisms, Inc., Box 10221, Tampa 9, Florida.

Use postpaid card. Circle No. 15

HOLE PUNCHING UNITS WITH STEEL CAST HOLDERS



Hole punching units featuring all-steel cast holders provide longer life by combining higher tensile strength and longer wear, plus greater bearing surface for punch guides.

The Unipunch Type AJ series is available with either pedestal dies or die adapters with button dies.

The new units are companion units to the Type A series and permit interchangeability of replacement parts. Shut height is 8⅜" and die height 3½". Units are available in 1¼", 1½" and 2" holder widths with 4", 8" and 12" throat depths for punching holes in up to ¼" thick mild steel.

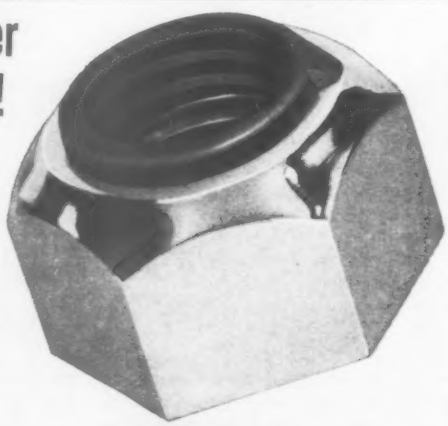
Punch Products Corp., 3800 Highland Ave., Niagara Falls, New York.

Use postpaid card. Circle No. 16

NEW DRAWING TRIANGLE

Combining the advantages of a protractor, straight edge, and scales in one instrument, the Draft-All triangle can be used to construct complete mechanical drawings. Permanently stamped into a standard 8", 45°/90° plastic triangle are the four popular scales—1",

There Is No Other Locknut Like This!



Security Locknuts Hold!

- They do not require BOLT TENSION. They are self-locking anywhere on the bolt and can be adjusted or re-adjusted at any time.
- They can be removed or replaced at any time without losing their locking effect or damaging the bolt.
- They will not loosen even under extreme vibration.
- The load is carried by the bolt, not the Locking Insert.
- They are installed with an ordinary wrench, saving hours of time over the use of castle nuts, double nuts or peened bolt ends.
- They are supplied in sizes from ⅜" to 4".

Send the Coupon for more details.

Security

THE NUT YOU CAN'T SHAKE LOOSE

HOW IT WORKS!

Made of the finest spring steel available, the high-tension spring steel Locking Insert is elliptical in shape and is a permanent part of the Locknut. As the nut is forced on the bolt, the spring steel is forced into the round and grips the bolt with terrific tension. The nut will remain in place.

SECURITY LOCKNUT CORPORATION

North Avenue at 15th Avenue, Melrose Park, Ill.

Here is a drawing of our product. What self-locking fastener would you suggest? ☐

Company Name _____

Address _____

Town _____ State _____

Signed _____ Title _____

Use postpaid card. Circle No. 243

TORQUE BOOKLET

This 24-page booklet contains reprints of five authoritative articles on the subjects of "torque, tension and tightening." These articles were originally published in "Assembly & Fastener Engineering."

- WHAT IS PROPER TORQUE?
- HOW TIGHT IS TIGHT?
- HOW TO DETERMINE TORQUE TENSION RELATIONSHIPS
- TIGHTENING THREADED FASTENERS
- POWER TOOLS FOR TIGHTENING THREADED FASTENERS

The booklet is available for $1.00 per copy upon letterhead request to:

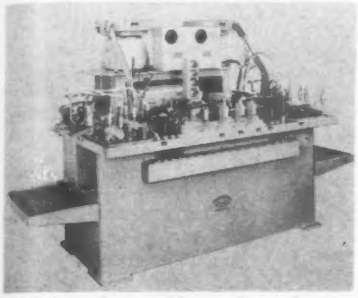
Reader Service Department
ASSEMBLY & FASTENER ENGINEERING
WHEATON, ILLINOIS

¼", 1/6", and 1/10" as well as guide lines for construction of 90°, 75°, 60°, 45°, and 30° line intersections.

Draft-All Triangle Co., 152 W. 42nd St., New York 36, N.Y.

Use postpaid card. Circle No. 17

AUTOMATIC CONTINUOUS TAPPER CUTS DOWNTIME



Solving the problem of production time-loss in the withdrawal of taps from work is an advantage of a continuous automatic tapping machine.

A double-ended lead screw type spindle with special 2 hp. high-rever al motor drive is arranged so that the tapping operation at one station is coincident with the withdrawal at the opposite station. There is automatic hopper feed from above at each end of the spindle.

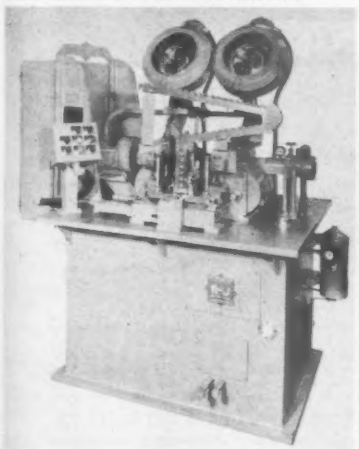
The tapping spindle moves on a horizontal plane with capacity for handling taps to 1¼" diameter. Multiple heads can be mounted. Safety interlocks are provided.

Typical volume operations include work in electrical lock nuts, tee nuts, odd and oversize parts.

The Bodine Corp., 317 Mountain Grove St., Bridgeport 5, Conn.

Use postpaid card. Circle No. 18

MACHINE ASSEMBLES NEEDLE ROLLERS INTO BEARINGS



An assembly machine can be adapted to assemble needle rollers into many types of gears and bearings.

The special machine automatically feeds and greases the I.D. of an automotive transmission gear and loads 22 needle rollers into the gear.

The production rate of 2200 assemblies per hour is accomplished by a hydraulically-operated reciprocating

It would take you over three months to walk past Harper's complete stock of **corrosion-resistant fastenings...**

Harper manufactures and maintains the world's largest stock of standard and non-standard fasteners in Stainless Steel, Brass, Monel, Silicon Bronze, Naval Bronze, Aluminum, Copper, Titanium, and other corrosion-resistant alloys. Harper's operation is complete—from elements, billets and extruding to rolling and fabricating parts—uniform quality control that assures you of the finest parts that money can buy, yet includes the economies that only an integrated operation can realize. This is another important difference that separates Harper from other fastener companies all over the world. Harper distributors everywhere maintain complete stocks for immediate delivery. See your Yellow Pages.

Write for your free copy of new, factual, informative 24-page "CORROSION GUIDE."

THE H. M. HARPER COMPANY

8214 Lehigh Avenue • Morton Grove, Illinois

ANOTHER BIG HARPER

Difference!

Use postpaid card. Circle No. 244

HARPER

slide which loads a gear at each index.

Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.

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2 KW OUTPUT, GENERATOR FOR SOLDERING, BRAZING

A 2 kw output generator answers the need for a smaller, lighter generator with capacity to handle medium-to-high rates of production. It is used in brazing, soldering, hardening, annealing, and forging operations.

The Ther-Monic 150 has a two position transfer switch capable of having two work coils, permitting the operator to heat objects alternately. The unit's automatic timer can be pre-set for various timing operations.

Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, New York.

Use postpaid card. Circle No. 20

AIR AUTOMATION TOOLS WILL FASTEN, DRILL, TAP

Automation tools, combining the efficiency and economy of air motors and air cylinders, have been introduced for drilling, tapping, fastening, grinding, reaming, counterboring, and wire brushing.

Where most Buckeye tools produce rotary motion only, the 21K and 21L Series also provides linear motion, moving from its fixed retracted position to the precise work spot. Length of the stroke can be adjusted to micrometer accuracy over the 0" to 2" range by rotating the graduated external sleeve, then locking it in place. Tools may be operated singly or in groups following any desired sequence with controls matched to the desired degree of automation.

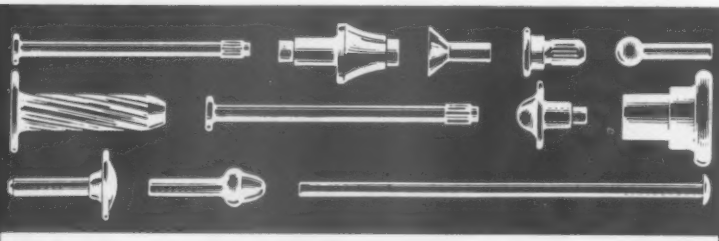
The two series differ only in the construction of the feed cylinder. The 21K Series is retracted by a spring return system, while the 21L is retracted by a double-acting cylinder to preserve higher feed and/or retraction forces.

Buckeye Tools Corp., 5003 Springboro Pike, Dayton 1, Ohio.

Use postpaid card. Circle No.21

PRESS TYPE SPOT WELDER IN FOUR KVA RATINGS

An air operated press type spot welder is available in 30, 50, 75 and 100 kva ratings. It has a roller bearing guided ram of hollow construction, hardened semi-steel and jig ground.



Job-Designed Rivets for Every Industry

Hassall

Here is a fast, dependable, low cost, quality minded source of supply for JOB-DESIGNED fasteners of all types, in any metal, to fit your own assembly problem. Assembly costs are a very major part of manufacturing expense. Most of this is labor. The fastening medium itself is usually a minimum item. If a Job-Designed fastener makes assembly simpler and faster, permits the use of fewer fasteners, allows the designer functional freedom and improves product efficiency, yours is a specifying job well done. All these possibilities are available when you come to Hassall for design assistance and quotation on challenging, difficult or unusual rivets, threaded nails, drive screws and other cold headed parts. Short or long runs, pilot quantities, engineering counsel, over 100 years of intimate association with cold heading—and a deep appreciation for the concept of value analysis—all are part of the Hassall service to you.

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JOHN HASSALL, INC.

MANUFACTURERS SINCE 1850

P. O. Box 2217 • Westbury, Long Island, N.Y.

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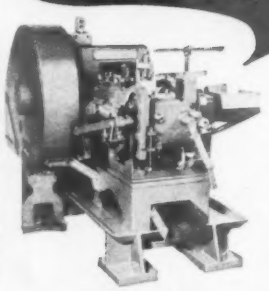
BEHR SINGLE and DOUBLE STROKE

COLD HEADERS

FOR UPSETTING AND FORGING BOLTS, SCREWS, RIVET HEADS AND OTHER SIMILAR SHAPES!



175 PIECES PER MINUTE

D5SD

Capacity of wire, 1/4"; Stroke, 3"; Maximum length of cut-off, 2-7/8"; Maximum length of blank under head, 2"; Diameter and length of heading die, 1-3/4" x 2-1/2"; Diameter of finished punch, 1-1/4" x 2-1/4" long; Speed — Number of pieces per minute, 175; Number of strokes per minute, 350; Lubrication, Force Feed; Weight, 6000 lbs.; Overall dimensions, 81" x 46" x 51"; Motor, 7-1/2 HP, 3 phase, 60 cycle, 220/440 volts. Each header complete with motor, push button station, and foot brake.

MANVILLE 250C HEADER PARTS AVAILABLE FROM STOCK

CALL ROCKFORD WOodland 2-7721 or WRITE for LITERATURE and PRICES

BEHR MACHINERY & EQUIPMENT CORP. 1210 SEMINARY ST. ROCKFORD, ILLINOIS

Use postpaid card. Circle No. 246

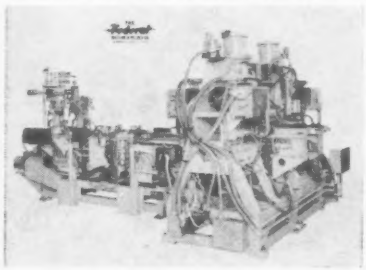
The ram is lightweight in order to minimize inertia and provide rapid follow-up on any welding condition. A section of the ram is deep from front to back, minimizing deflection due to welding forces as normally applied. Four ground surfaces provide running surfaces for eight anti-friction bearings. Four bearing rolls are at the top of the ram, four more at the bottom.

The ENC press welder is of welded steel construction with maximum resistance to mechanical deflection. The rigid, cast semi-steel head support is horizontally keyed and bolted to, but insulated from, the upper head extension of the frame. It is unnecessary to insulate any special lower knee or work tables.

Taylor-Winfield Corp., Warren, Ohio.

Use postpaid card. Circle No. 22

MULTI-GUN COMBINATION SPOT, PROJECTION WELDER



A special multi-gun flat top combination spot and projection welder with bending unit forms and welds range oven frames at a rate of 165 assemblies per hour.

Federal Machine & Welder Co., Warren, Ohio.

Use postpaid card. Circle No. 23

ADJUSTABLE HEAVY DUTY SIDE GRIP CLAMP

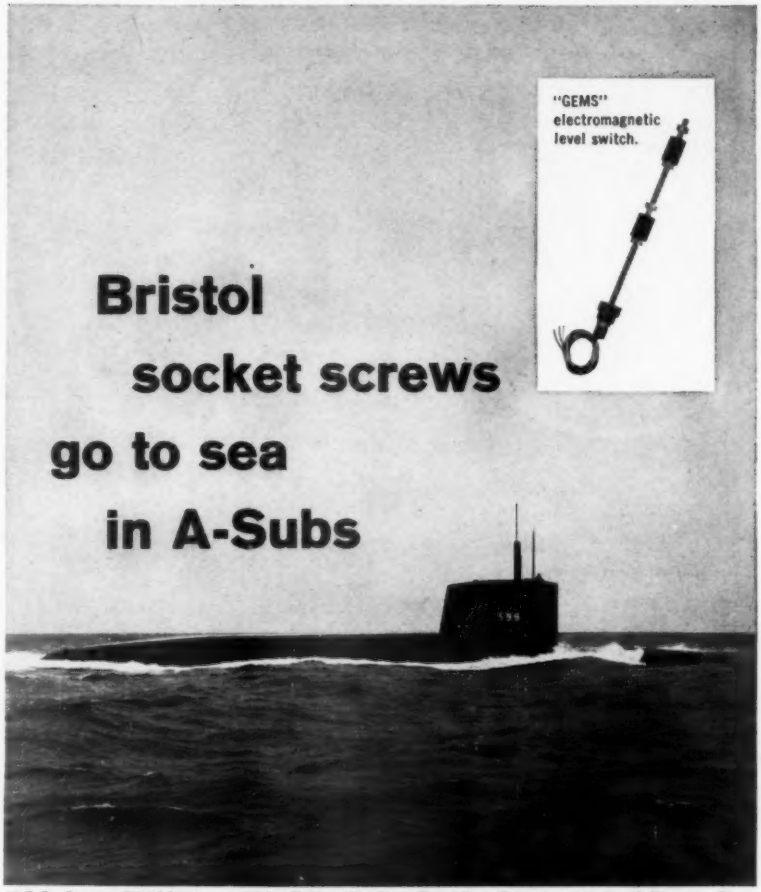
A heavy duty side fastener is a new version of the standard side grip clamp, adjustable for material thickness ranging from 0"-15/16". It provides a method of adjusting to any desired spring pressure within the capability of its heavy duty completely enclosed spring, providing light, medium or heavy spring pressure.

Zinc based alloy gripping jaws are safe for use on soft aluminum production parts. Work may be held with 1-1/16" deep jaw throat or 3/8" deep jaw heel.

The clamp is designed as a replacement for many types of screw, C-toggle or cam operated clamps.

Monogram Mfg., Kleko Clamp Division, 8557 Higuera St., Culver City, California.

Use postpaid card. Circle No. 24



U.S.S. George Washington, missile-firing atomic submarine. Photo courtesy of Electric Boat Division of General Dynamics Corporation, Groton, Conn.

Bristol Multiple-Spline socket screws are playing an important part in "GEMS" switches, used on some of the U. S. Navy's newest atomic submarines.

The GEMS Company, Newington, Conn., has standardized on the Bristol Multiple-Spline socket screw for use in their line of level switches, flow switches and other special switches. GEMS (stands for "Guaranteed Electro-Magnetic Systems") likes the Multiple-Spline because it takes tighter wrenching and because the distinctive spline design tends to prevent mechanics from disturbing critical calibration-holding screws without proper test equipment.

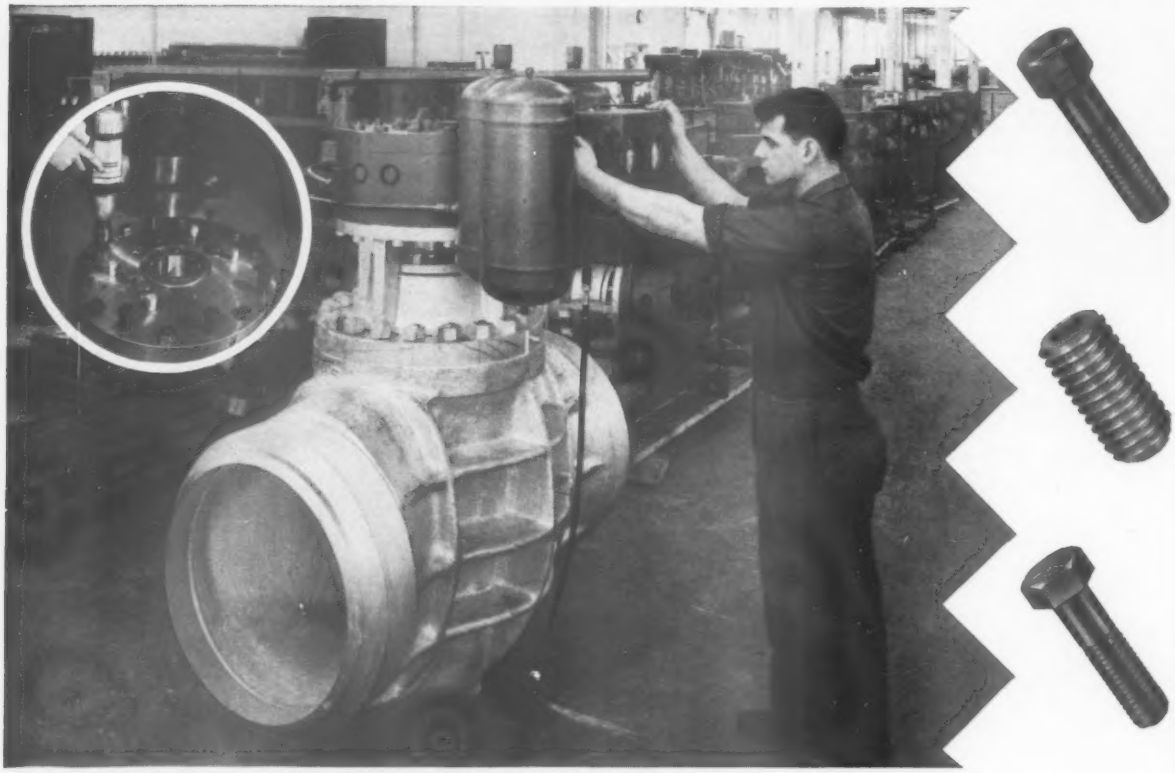
This application is just one of thousands of jobs Bristol Multiple-Spline socket screws are doing in today's complex technology. They're ideal for electronic computers and communications equipment, appliances, desk calculators and other office equipment, precision machine tools, and a tremendous variety of other equipment.

Bristol socket screws are available in a complete line from leading industrial distributors. Both cap and set screws come in industry standard hex socket, as well as in the Bristol-originated Multiple-Spline sockets—sizes as small as No. 0. See your Bristol distributor; he can give you complete information on sizes and types available and fill your requirements with fast delivery from complete distributor stocks. A.O.3

Precision socket screw manufacturers since 1913
Bristol's Hex Socket Screws
Bristol's Multiple-Spline Socket Screws
*Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diameter.
THE BRISTOL COMPANY
Socket Screw Division
Waterbury 20, Conn.

See us in Booth 1631 At the ASTE Show.

Use postpaid card. Circle No. 247



Stanscrew service adds strength, lowers costs for Shafer Valve Company

The valve operators produced by Shafer Valve Company of Mansfield, Ohio are used to open and close large valves on gas pipe lines . . . often in remote locations, many miles from human supervision. They are subject to sudden surge loads which cause extremely high stresses . . . and their critical importance demands unfailing reliability of all components.

Shafer formerly manufactured their own fasteners for this demanding application from a special high strength steel. Then their distributor arranged for a visit from Stanscrew's fastener specialist. He quickly established that Stanscrew's heat-treated "Carbon Restoration" cap screws, correctly applied, could provide even greater fastener strength . . . and at a significant saving in cost.

The Stanscrew fastener specialist may be able to make similar savings or improvements in your assembly operations. For he brings to your application the experience and facilities which have made Stanscrew a leading supplier of fasteners to the top names in American industry for over 80 years. And he can select money-saving answers to your problems from a complete line of over 5,000 different types and sizes of standard fasteners . . . always in stock, quickly available.

Whatever your fastener requirements, call your nearby Stanscrew distributor today. He will arrange for a prompt visit from the Stanscrew fastener specialist.

STANSCREW FASTENERS

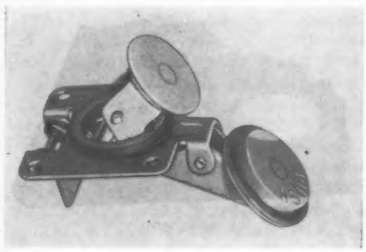
CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

Use postpaid card. Circle No. 248

WHAT'S NEW IN FASTENING AND JOINING

For further information on any of the fasteners or methods listed here, use the handy postpaid card opposite page 74.



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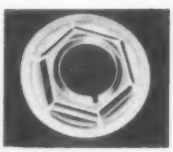

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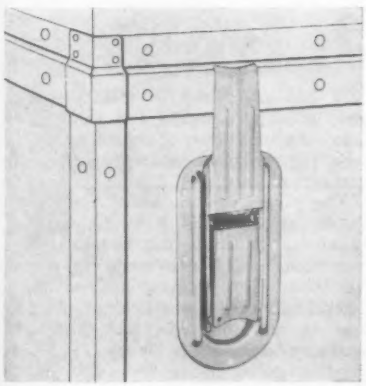


(See 26)

FLUSH-TYPE LATCHES FOR ELECTRONIC BLACK BOXES

Flush-type latches for black boxes used in electronic applications are quick opening, have secure over-the-center locking and are light in weight.

The Missile-Air latch has a close button which can be used as a handle when the latch is open. In arctic weather, for example, the large-size push button is easily worked with heavy gloves.

United States Chemical Milling Corp., 1700 Rosecrans Ave., Manhattan Beach, California.

Use postpaid card. Circle No.25

SPRING-LOADED CATCH SEALS TO 200 LBS.

A spring-loaded catch for transit cases and similar applications is preloaded at 35 lbs. with sealing force increasing to 200 lbs. This makes the catch useful with rubber gaskets where waterproofing is necessary.

The rib-constructed Clench has remained operative after being subjected to a pull force of over 1000 lbs.

The mounted dish is provided with a crimped edge to assure positive seal against the gasket. The catch is available also without the dish for surface mounting. Provision is made for insertion of a pilferage seal.

J. H. Sessions & Son, Bristol, Conn.

Use postpaid card. Circle No. 26

BLIND RIVET KIT PERMITS DESIGN EXPERIMENTATION

A kit permits design experimentation with various sizes and types of Pop blind rivets. It contains installation instructions, hand pliers for setting rivets and idea material. Price: $19.95.

The rivets are set from one side of the work. A hollow rivet is pre-assembled on a solid headed mandrel which is used to set the rivet. The mandrel head is larger than the end of the rivet. When the head is pulled into the rivet with the setting tool, the mandrel head clinches the rivet. Mandrel breaks near head under tension when rivet is set.

Pop Rivet Div., United Shoe Machinery Corp., 101 River Rd., Shelton, Connecticut.

Use postpaid card. Circle No. 27

SPRING LOCK WASHER FOR HEAVY DUTY USE

A non-entangling positive type spring lock washer is designed for stronger-than-normal tension applications.

The NonLink Positive has two angle cut ends to deeply embed and engage the nut, screw or bolt face and bolted surfaces. Its calibrated tension compensates for dimensional changes in a bolted assembly as a result of wear, expansion, contraction and stresses.

Reliance Div., Eaton Manufacturing Co., Massillon, Ohio.

Use postpaid card. Circle No. 28

SPRING STEEL CREST NUTS

Crest nuts made of heat treated spring steel, have dimensions of ⅛"-27 NPS, hex width 9/16", washer diameter ⅞". They are available cadmium plated, nickel plated, black phosphate and plain. Samples.

Crest Products, Inc., P. O. Box 64, Union, New Jersey.

Use postpaid card. Circle No. 29

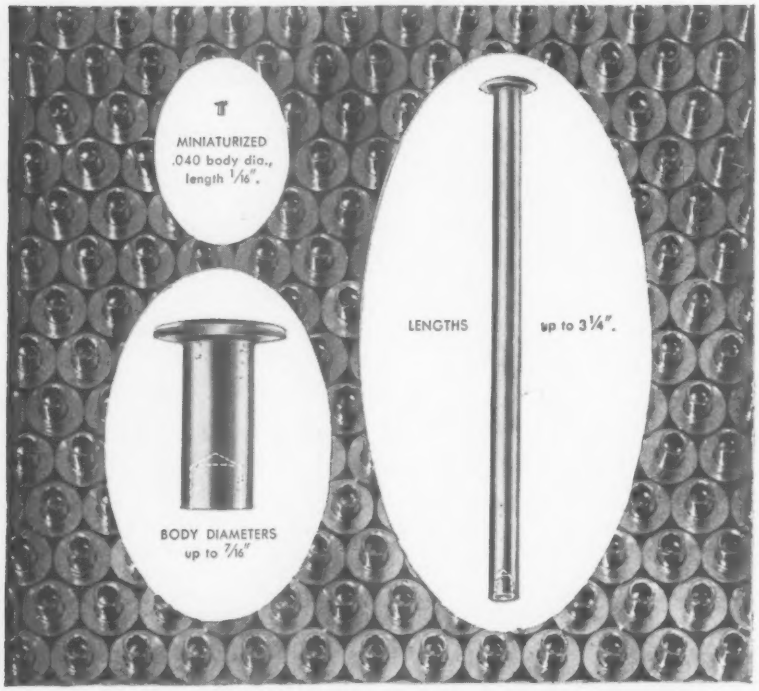
BOLTS, NUTS FABRICATED FROM GEON VINYL

Fasteners, such as bolts and nuts, are now being made of Geon vinyl to reduce construction costs. The material can be heat formed and has excellent machinability. It is suitable for underground use regardless of soil conditions, and is not subject to galvanic or electrolytic action.

The vinyl used in the new bolts and nuts has a specific gravity of 1.4. It is one-half the weight of aluminum and one-sixth the weight of steel. The parts are made of round or hexagonal rod. Fillister, hexagon and flat head bolts are available in any standard size.

Vinyl has many characteristics that make it well suited and economical for use in applications where corrosion is

Look at this Size Range of Semi-Tubular Rivets... it's the way to lower cost



Miniaturized components and also large complete assemblies can now have all the money-saving advantages of using single and multiple automatic riveting. This is due to the wider size range of semi-tubular rivets now available and which can be used in conjunction with motor and pneumatic driven automatic riveting machines.

Today, there is hardly a fastening problem, involving even fragile materials, that does not warrant consideration of low-cost semi-tubular rivet setting.

Our Factory Riveting Specialists are ready to help you obtain the REAL COST FACTS on your own specific fastening problem. There is no obligation.

FOR YOUR FILES

Chicago Rivet Catalog describes 1388 standard tubular and split rivets and 25 single and multiple automatic rivet setters.

AIR-POWERED RIVETING

contains description and specifications of 8 single, multiple riveters— also rivet setters designed for automated operation.

Chicago Rivet & MACHINE CO.

946 So. 25th Ave., Bellwood, Ill. (Chicago Suburb)
Branch Factory: Tyrone, Pa.

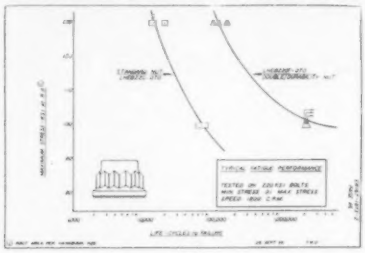
Use postpaid card. Circle No. 249

a problem. It is lightweight, inert, non-toxic, tasteless, weather resistant, non-aging and non-sparking. It is mechanically stable, non-flammable and will not support combustion.

Industrial Plastic Fabricators, Inc., Norwood, Mass.

Use postpaid card. Circle No. 30

LOCK NUT THREAD DESIGN DOUBLES BOLT FATIGUE LIFE



Self-locking nuts have been redesigned to double the fatigue life of bolts with which they are used. The standard UNF-3 thread form has been modified to redistribute concentrated stress loading.

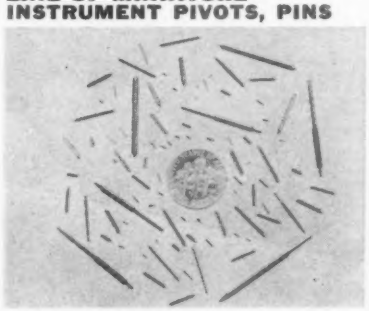
Photoelastic analysis indicated that fatigue failure almost always occurred where the first thread fully engaged the nut. The entire load centered on the first three threads. The Equa-Stress form makes these lower threads more flexible and passes the load along to a greater number of threads.

The form can be incorporated in any standard high tensile nut configuration and four types of Elastic Stop nuts have already been established. Double/Durability nuts offer a high margin of safety and reliability for critical connections.

Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N.J.

Use postpaid card. Circle No. 31

LINE OF MINIATURE INSTRUMENT PIVOTS, PINS



A line of miniature pivots, shafts, and pins is designed for makers of precision instruments, and other products requiring this specialized type of component.

The pivots are machined from high grade carbon steel heat treated for maximum hardness, polished to a mirror finish, and delivered ready for assembly. Heat treating and polishing operations are planned to eliminate distortion, and to retain the glass-hard surfaces on bearing points. Conical bearing point angles from 45° to 70° are turned for perfect centering and

assembly and fastener engineering

APRIL, 1960

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291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310

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1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
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111	112	113	114	115	116	117	118	119	120
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131	132	133	134	135	136	137	138	139	140
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111	112	113	114	115	116	117	118	119	120
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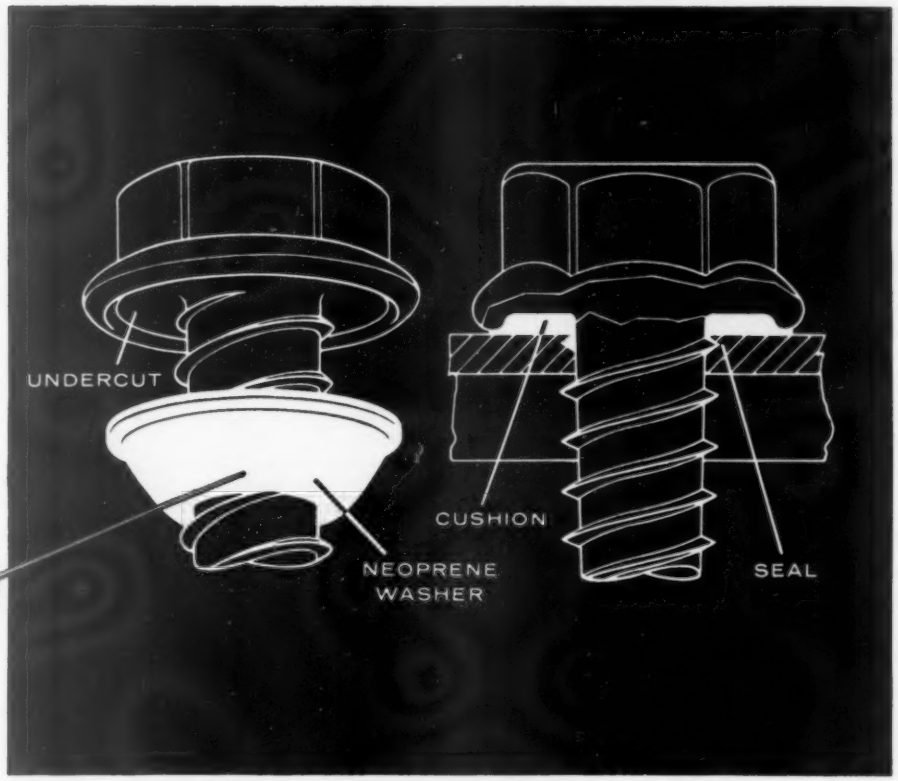
NAT'S
quick facts
about
Fasteners...



With TUFF-TITE TRADEMARK Fasteners ...it's the cushion control that counts!

You can be very sure of this, in using Tuff-Tite® Cushioned Fasteners.

The preassembled neoprene washer won't ooze off in just any old direction when it's compressed under the head.

It will stay put and do what it's intended to do:

- Form a firm, even cushion under the head
- Seal off the fastener hole
- Prevent fluid leaking past the thread
- Dampen vibration noises around the head
- Protect fine finishes against marring and crazing

. . . because Tuff-Tite's undercut head and tough molded neoprene washer assure consistent cushion control. The undercut confines the spread as the washer is compressed, and the molded shape guides the flow into the top threads, to seal the hole.

It's as simple and as certain as that, for any application requiring fastener sealing and cushioning. Tuff-Tite Fasteners* are available as Machine, Self-Tapping, or Wood Screws, as Stove and Roofing Bolts, and can also be made as Special Fasteners. We'll be glad to work with you on your possible applications.

*More details and specifications on standard types and sizes are given in the Tuff-Tite Fastener folder. Write for your copy.

National PRODUCTS

The National Screw & Mfg. Company • Cleveland 4, Ohio

California Division, The National Screw & Mfg. Company • 3423 South Garfield Avenue, Los Angeles 22, California

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smooth operating performance. The pivots are available in a wide range of diameters: .016" to .125" and in lengths from .050" to .750" with radii from .0008 to .004". Ends can be supplied with conventional or specified shapes. Samples.

John Gillen Company, 2540 So. 50th Ave., Cicero 50, Ill.

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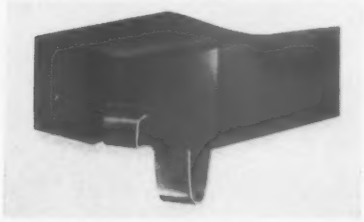
RUBBER-CLIP BUMPERS INSTALLED WITHOUT TOOLS



Bumpers can be installed permanently or semi-permanently without using tools. The Cooper Clip consists of a rubber extrusion and spring steel retaining clip, which also acts as a fastener for the entire assembly.

Two basic styles are available. The vibration-resistant dynamic style is recommended for suspension applications and has four prongs. The static model is designed for fixed loads.

Seven types are the small and large utility bumpers, bantam bumper, shock mounts, self-leveling and tapered foots.

Industrial Rubber Products Div., Dept., 3-E, Cooper Tire and Rubber Co., Findlay, Ohio.

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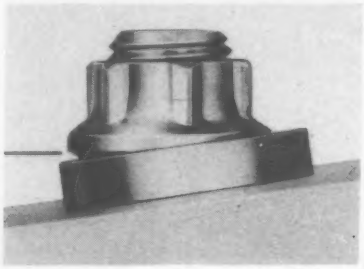
HI-TENSILE NUT PERMITS 8° ANGULAR MISALIGNMENT



Space and weight savings at increased strength levels are offered by a self-aligning, six-point nut-washer combination. It can accommodate surfaces with up to 8° slope, eliminating spot facing.

The Kaylock H19300 nut and K19301 washer is designed specifically for 160,000 psi short thread bolts.

Compactness permits use of wrenches two sizes smaller than those used on standard AN and NAS nuts. Weight advantages range from 48% to 62% lighter than older design self-aligning hex nuts, depending on thread size.

Kaynar Mfg. Co., Inc., Box 2001, Terminal Annex, Los Angeles 54, Calif.

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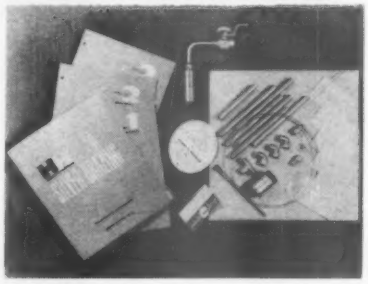
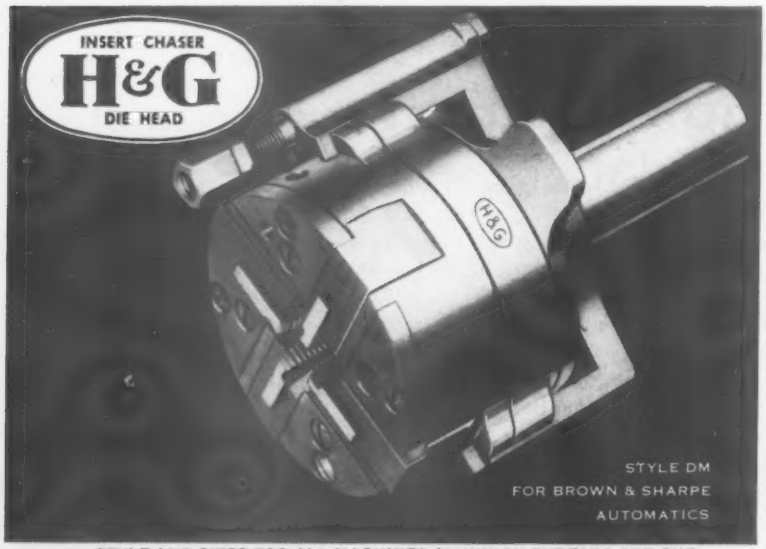
PACKAGED SILVER ALLOY BRAZING TRAINING COURSE



A self-study training course in the principles and techniques of silver alloy brazing comes complete in a single package containing three textbooks and all parts, materials and supplies needed to perform lesson exercises.

The training course consists of three sections. Six lessons explain the fundamentals of silver brazing. Nine exercises are to be performed on the basic types of joints in both flat or tubular members and employing similar or dissimilar metals. Section three translates these principles into production techniques.

All parts, brazing alloys, fluxes and other materials needed to complete the exercises, as well as all three texts in a single loose-leaf binder, are packed in a single 12"x12"x2" heavy cardboard box. In addition, the Handy alloy calculator for determining the amount of al-



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

On Brown and Sharpe, and other automatics

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For approximately $50 you get a dozen sets of ¾–16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime.

FREE: "UNIFIED AND AMERICAN SCREW THREAD DIGEST."

THE EASTERN MACHINE SCREW CORPORATION, 25-48 Barclay St., New Haven, Conn.

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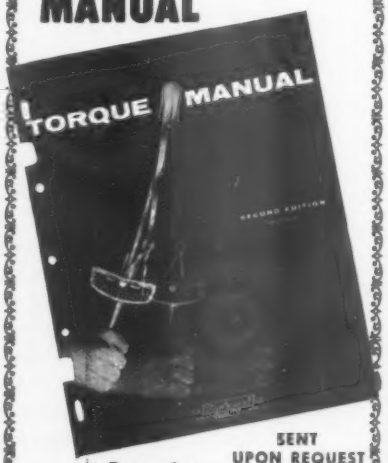
"TORQUE WRENCH" MANUAL



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Stays put . . . for keeps

FLEXLOC

Put FLEXLOCs on your assemblies and relax. They're going to stay put . . . "for keeps" . . . regardless of the shock, the pounding, the vibration. These self-locking nuts simply won't work loose.

With the 1-piece all-metal FLEXLOC, no lockwashers, jam nuts, cotter pins, or other auxiliary locking devices are needed. There's nothing extra to put

together, come apart or get lost. Assembly time and costs are reduced. And maintenance expenses are cut, because FLEXLOCs can be readily removed, repeatedly reused.

One more major FLEXLOC feature: they lock seated or not once 1½ threads of the bolt are past the top of the FLEXLOC.

So insist on FLEXLOCs and keep your assemblies operating at full efficiency . . . full time. See your authorized industrial distributor for complete information on sizes, materials and finishes. Or write SPS—manufacturer of precision threaded fasteners and allied products in many metals.

INDUSTRIAL FASTENER Division

JENKINTOWN 78, PENNSYLVANIA **SPS**

where reliability replaces probability

Use postpaid card. Circle No. 253

loy required for a given joint, and a pocket-sized fundamentals "reminder card" are enclosed to serve the student as handy permanent on-the-job reference.

Training Div., Handy & Harman, 82 Fulton St., New York 38, N.Y.

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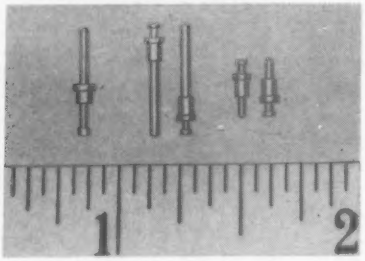
FEED-THRU TERMINALS FOR PLUG-IN COMPONENTS



Three sizes of feed-thru terminals are designed for use in plug-in electronic components.

The Cambion 1030 and 1031 terminals fit into 7 or 9-pin miniature sockets, have pin diameters of .040" and are available in six mounting shank lengths. Terminal 1032 has a pin diameter of .032" and comes in five mounting shank lengths. All are brass, finished with silver plate and coated with water dip lacquer.

Cambridge Thermionic Corp., 445 Concord Ave., Cambridge 38, Mass.

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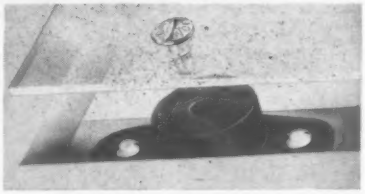
QUARTER-TURN FASTENER ABSORBS SHOCK, JOLTS



A quarter turn fastener designed for use where shock resistance is important consists of the standard Lion No. 2 quarter-turn stud and retainer, with the spring installed in a special mounting assembly.

This mounting assembly, first used in production on the Boeing 707, is composed of an aluminum plate to which a .500" thick neoprene rubber boss is permanently bonded. The steel spring for closure is bonded into the rubber boss to provide a sturdy, rattle-proof unit capable, when closed, of withstanding severe tension and shear forces. Two holes in the mount are provided for simple, fast installation. Vibration mount fasteners are available with studs in different sizes to meet varying thickness requirements. Each of the stud sizes handles a particular minimum to maximum range of thicknesses.

The fasteners require only ¼-turn to open, ¼-turn to close, tolerate misalignment, have a high strength-weight ratio. The stud is swage-nosed. There are no thin cross-pins, no milled out sections.

Southco Division, South Chester Corporation, Lester, Pa.

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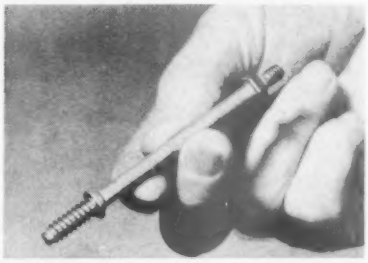
SELF-TAPPING FASTENER FOR CURTAIN WALL ERECTION



A self-tapping screw fastener combines the work of three fasteners used in conventional erecting of curtain wall sections.

The cold headed CW Topseal fastener, which has a tensile strength of 90,000 psi, replaces a bolt, nut and washer combination in fastening the interior sheet to the framing; a spacer bar to hold the insulation, and an additional fastener to secure the exterior sheet to the inside sheet.

Fabricated Products Co., West Newton, Pennsylvania.

Use postpaid card. Circle No. 38

BOLTS: machine - carriage - lag - stove - threaded rod - studs - U - J - eye

SCREWS: Phillips - slotted - socket - machine - wood - cap - set - thumb metal (self tapping) - Sems - spin-cock

NUTS: hex - square - machine screws - stove bolt - finished - heavy - cap - wing-FLEXLOC - elastic

WASHERS: wrought - square - bevel - flat - lock - internal - external - CTSK - finishing - machine screw - SAE

MISC: cotter pins - taper pins - dowel pins - expansion bolts - shields -toggle bolts -

Let us quote on your requirements; Write today

Stainless
Monel
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Aluminum
Alloys
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Corrosion Resistant bolts, nuts screws, washers

Delivered when needed . . . because our stocks, our equipment and our staff are specialized to give you quality, dependability and service. We take the pressure off your production department . . . make the job easier for your purchasing and engineering department.
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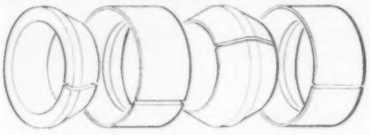
And fight cancer with a check!

Mail it to CANCER, in care of your local post office —NOW

AMERICAN CANCER SOCIETY

IMPROVE FASTENER FITS WITH ADJUSTABLE BUSHINGS



A wall thickness bushing permits radial dimensions to be varied by a simple mechanical adjustment.

Typical applications include use with close tolerance fasteners, salvage of over-size holes, anti-backlash, hinge and pivot pins, replacing taper pins and pressed-in-place pins, or bolts sealing around bolts, structural steel fabrication and shaft clamps.

Consisting of a series of alternate male and female segments aligned axially, the application of an axial compressive force to the ends of the bushing causes the male segments to assume a smaller diameter, thus reducing the I.D. of the bushing. At the same time the female segments are assuming a larger diameter, increasing the O.D. of the bushing. The simultaneous action results in a thicker wall for the bushing providing an exact fit without machining.

The bushings are available in powered metals, bronze, nylon, teflon, stainless steel.

Adjustable Bushing Corp., 12036 Vose St., North Hollywood, Calif.

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TEFLON PARTS HELD TO CLOSE TOLERANCES

Mechanical components of Teflon are being produced to tolerances of less than .001". Custom-designed screw type fittings, balls, bearings, structural parts are machined and extruded.

Tri-Point Plastics, Inc., 175 I.U. Willets Rd., Albertson, L.I., N.Y.

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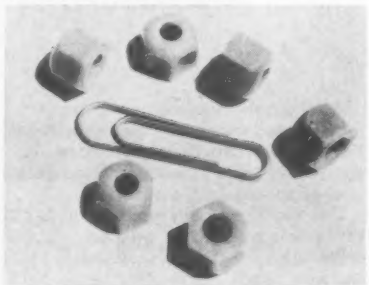
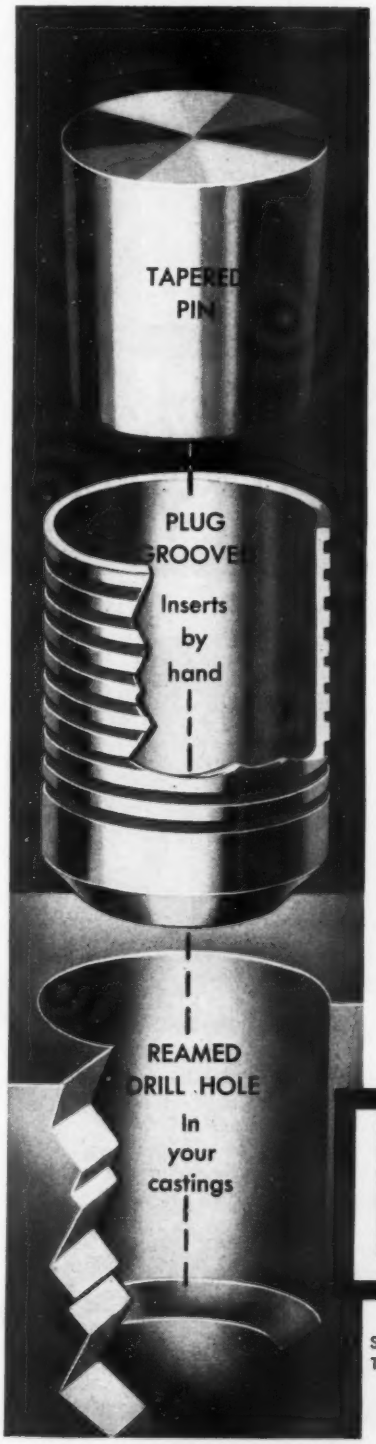
ACORN LOCK NUTS IN COLORED DELRIN



Open-end acorn lock nuts made from Delrin have been developed for lawn furniture, toys, hotel luggage racks, aluminum tubing products and similar light duty applications where corrosion resistance and reusable locking action are desirable.

The prevailing torque Delrin nuts offer metal-like mechanical properties. They have excellent strength, rigidity, dimensional stability and resistance to water and organics. Non-toxic and odorless, the material is light in weight,

Proved! New, Better Way to Seal Drilled Holes with . . .



Less weight!

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NEW PIN-PLUGS®

Seal simply, positively Prevent costly leaks!

Now — forget conventional, costly methods of sealing holes that serve as flow or pressure passages. The Lee "Pin Plug" is a cylindrical plug with a tapered reamed hole partway through its center and numerous small grooves on its outside surface. Simply place it into reamed hole and drive in the tapered pin until ends are flush. Controlled expansion causes grooves in plug to "bite" into casting and form independent seals and retaining rings. Extensive laboratory tests report no leaks under normal pressures, often show bone dry seals up to pressures of 40,000 psi.

Now successfully and widely used on aircraft and missiles — for pumps, servo valves, regulators, etc. Available steel and aluminum and in both long and short series.

® Pat #2,821,323

LEE CO.

SOME TERRITORIES STILL OPEN FOR QUALIFIED TECHNICAL SALES REPRESENTATIVES.

Write today for Standard Sizes and Engineering Data

THE LEE COMPANY

523 BOSTON POST ROAD OLD SAYBROOK, CONN.

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abrasion resistant and smooth to the touch.

No. 10 and ¼" sizes are available. Since the nut forms its own thread as it is assembled, the No. 10 size fits both 10-24 and 10-32 threads, and the ¼" size fits both ¼-20 and ¼-28 threads. Colors available are metallic gray to blend with aluminum, metallic gold and natural (off white).

The nuts have a holding strength of 500-600 lbs. under straight tension for the No. 10 size and 600-700 lbs. for the ¼" size. Prevailing torque is 8-10 in.-lbs. for No. 10 size and 10-14 in.-lbs. for ¼" size, while stripping torque is more than 20 in.-lbs. for the former and 25-30 for the latter size.

Russell, Burdsall & Ward Bolt and Nut Company, Dept. DN, 104 Midland Ave., Port Chester, N.Y.

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CONDUIT CLAMP LOCKS LIKE A BELT BUCKLE

A clamp which locks like a belt buckle is designed for fastening and hanging rigid or thin wall conduit. Only standard electrician's pliers and a screwdriver are needed for installation.

The one-piece Libery clamp comes in standard sizes from ½" to 1¼".

The Paine Co., 38 Westgate Rd., Addison, Illinois.

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OFFER O-RINGS AS STANDARDS IN ARP SIZES

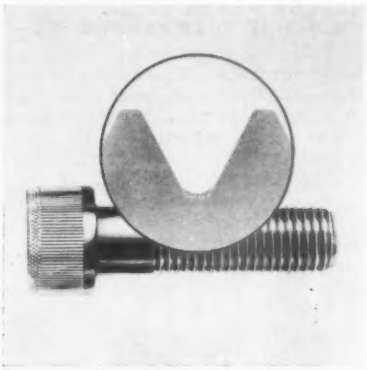
Viton O-Rings are offered in all ARP (AN & MS) sizes as standards. The versatile high temperature material was formerly available only as a special or out of regular tooling which produced undersized O-Rings.

The program also makes possible finer dimensional control and better O-Ring qualities heretofore not possible in Viton with regular molds and processing methods. Sizes offered cover all Viton compounds.

Parker Seal Co., Culver City, Calif.

Use postpaid card. Circle No. 43

IMPROVED SOCKET SCREW THREAD RESISTS FATIGUE



A socket screw combines the stronger head and increased bearing area of the 1960 Series, pHd socket screw with the smoothly-radiused root configuration of the Hi Life thread.

The big head bolts give up to 2-1/3 times more holding power without indentation of softer materials, while the new thread form adds up to 100% improvement in fatigue life.

Representing a major socket screw advance, the Unbrako pHd (for proper head design) innovation features increased bearing area under the head and large wenching socket. The thread form eliminates sharp notches that result in heavy stress build-up at the root of the thread and potential failures. Both features are now standard on Unbrako socket-head cap screws.

Standard Pressed Steel Company, Jenkintown, Pa.

Use postpaid card. Circle No. 44

The new Morris-Omega "00" SDDS Cold Header forms parts from wire down to .012" diameter in lengths as short as .016" — and at production rates as high as 150 per minute!

The Model "00" is only one of a series of precision heading machines, which includes a special open die type that will head parts up to 2⅜" in length on wire sizes from .020" to .090".

For complete details and prices, write:

REM SALES INCORPORATED

SUBSIDIARY OF THE ROBERT E. MORRIS COMPANY

5010 FARMINGTON AVENUE • WEST HARTFORD 7, CONN.

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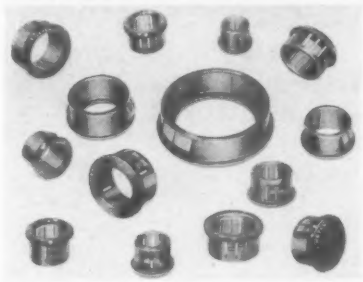
INSTALL NYLON BUSHINGS WITH FINGER PRESSURE



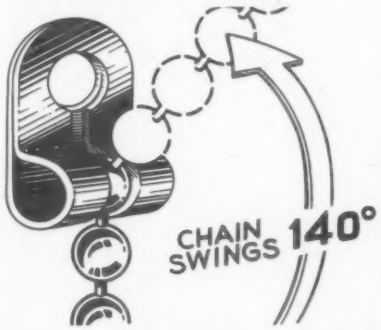
A line of nylon snap bushings can be installed in mounting holes under finger pressure yet will withstand a 35 lb. push back test. They remove by compressing the locking steps.

Heyco bushings are available for holes from ⅜" to 1½" in diameter and panel thicknesses up to ⅛". The UL and CSA approved parts will withstand temperatures in excess of 302° F. Samples.

Heyman Mfg. Co., 100 Michigan Ave., Kenilworth, New Jersey.

Use postpaid card. Circle No. 45

UNDETACHABLE D-COUPLING FOR BEADED CHAINS



A D-coupling for beaded retainer chains is non-detachable to offer protection against loss of the item to which it is fastened.

Attachable to any size or length of beaded chain, the coupling is available in several hole sizes for use with objects as electrical outlet plugs, machine part covers and caps, basin stoppers.

Auto-Swage Products, Inc., 2 Canal St., Shelton, Connecticut.

Use postpaid card. Circle No. 46

EPOXY RESIN SERIES EASY TO PROCESS

Oxiron epoxy resins incorporate higher proportions of reactants and are lighter in weight to offer advantages in handling and cost.

The new series is reported to have superior strength and stability at high temperatures, with excellent electrical properties and resistance to chemicals.

Developmental quantities up to drum amounts are currently available.

Chemicals & Plastics Div., Food Machinery and Chemical Corp., 161 E. 42nd St., New York 17, N.Y.

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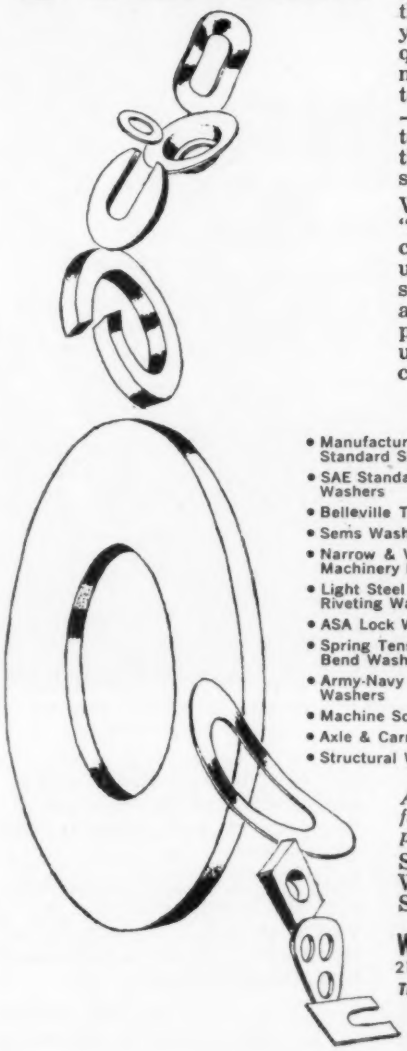
ALL ON ONE ORDER



You simplify procurement and assure satisfaction when you standardize on

MILWAUKEE WROT WASHERS

To get everything you need in washers — *on one order* — it pays to specify "Milwaukee Wrot" on every washer requisition you write.

One word tells the reason why. Specialization.

Milwaukee is the one prime source that has devoted more than 70 years to the volume production of quality washers. Special machinery — special production techniques — special facilities — special quality controls combine to make Milwaukee Wrot Washers the unmatched standard of superiority, the world over.

Whether your need is for "standards" or "specials," the complete Milwaukee line offers unrestricted selection. Factory stocks covering thousands of types and sizes, *plus* over 100,000 production-ready dies, make it unnecessary for you to tie up capital in long-range inventories.

TYPES AVAILABLE

- Manufacturers Standard Size Washers
- SAE Standard Flat Washers
- Belleville Type Washers
- Sems Washers
- Narrow & Wide Rim Machinery Bushings
- Light Steel & Riveting Washers
- ASA Lock Washers
- Spring Tension & Wave Bend Washers
- Army-Navy Standard Washers
- Machine Screw Washers
- Axle & Carriage Washers
- Structural Washers
- Countersunk Finishing Washers
- Flat & Bevel Square Washers
- Drawn Center Washers
- Bedspring & Mattress Washers
- Slotted & Split Rim Washers
- Expansion Plugs
- Cupped Washers
- Dished Washers
- D-Hole Washers
- D-Outside Washers
- Discs, Blanks & Special Designs to Virtually Any Specification

All Available in a broad range of ferrous, non-ferrous, stainless steel, plastic and fibrous materials

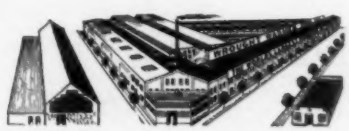
Standardizing on Milwaukee Wrought Washers Means Standardizing on Quality

WROUGHT WASHER MFG. CO.

2195 S. Bay Street • Milwaukee 7, Wisconsin

The World's Largest Producer of Washers

60-9720



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EC-1357 cuts costs, makes possible stronger sandwich panels

LABORATORY TESTS show EC-1357 provides the high strength and rigidity called for in nonload-bearing sandwich structures.

3M Adhesive EC-1357 bonds all kinds of skin and core materials *without heat.* You'll speed production, cut costs, build in high strength for non-load-bearing sandwich panels.

You can force-dry the solvent out of the adhesive prior to bonding. And a nip roller or cold press is all that is required to complete the bond.

EC-1357 provides maximum immediate strength. And the bond continues to strengthen as it cures at room temperatures.

Dark in color, EC-1357 absorbs infrared heat quickly, dries fast; so no production delay is necessary. And it sprays on with minimum cobwebbing, thus saving materials.

SEE WHAT 3M ADHESIVES CAN DO FOR YOU!

Consult 3M Research. Contact your 3M Field Engineer. Or, for information and free literature, write: A.C.&S. Division, 3M, Dept. SBZ-40, St. Paul 6, Minnesota.

ADHESIVES, COATINGS AND SEALERS DIVISION

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

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USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite page 74.

1960 CAP SCREW STANDARDS

Form CSN covers complete engineering technical standards for the 1960 series socket head cap screws. The loose-leaf format designed especially for engineers can be easily reproduced on conventional blueprint machines. Major changes are shown in color. The Holo-Krome Screw Corp., Box 98, Hartford 10, Connecticut.

Use postpaid card. Circle No. 55

SPRING STEEL NUTS, CLIPS

Seventeen case histories picture and describe assembly savings ranging from toys to dishwashers to box cars through the use of Speed Nuts and Clips. Colorful Bulletin 353 shows some of the 9000 variations available of these one-piece self-locking spring steel fasteners. Tinnerman Products, Inc., Box 6688, Cleveland 1, Ohio.

Use postpaid card. Circle No. 56

GEARED HEAD WRENCH

A geared head wrench for jobs requiring rotary force settings over 200 ft.-lbs. is the topic of a four-page brochure. The X-4 can be used wherever socket type wrenches are used. Mathematics of the wrench's power are included. Specifications listed. The X-4 Corp., West Acton, Mass.

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CONTROLLING BOLT FATIGUE

A major break-through in the fatigue life control of threaded fasteners is reported in 32-page Design Manual No. 5930. It illustrates the Equa-Stress modified UNF-3 thread form which will at least double the fatigue endurance of a standard high tensile bolt. The manual includes 17 pages of findings related to the basic nature and causes of fastener fatigue; six detailed drawings of the new Double Durability self-locking nuts; and applicable fatigue performance test results. Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N.J.

Use postpaid card. Circle No. 58

SCREW FASTENING GUIDE

A 48-page technical handbook, "Screw Fastening of Aluminum," covers the various types of standard and special fasteners and fastening systems used to join aluminum assemblies. The text is supplemented by 107 illustrations and 12 tables. It includes a list of manufacturers of special screws and recommended hole sizes for various types of self-tapping screws. Reynolds Metals Company, AFE-32, Richmond 18, Virginia.

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DESIGNING WITH NUTS

An entire line of lock nuts, weld nuts and semi-finished nuts are pictured and sized in an eight-page catalog. Information helps in selecting the proper fastener. A test procedure for prevailing torque lock nuts is also explained. MacLean-Fogg Lock Nut Co., 5535 N. Wolcott Ave., Chicago 40, Ill.

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PREFORM SOLDERING

Three technical reports on automatic soldering with preforms offer data on preform selection and use, converting to automatic soldering, and new, flux-filled washers for automatic soldering. Included is an offer of technical information on solder alloy and flux selection. Alpha Metals, Inc., 56 Water St., Jersey City 4, N. Y.

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EPOXY RESINS

Three new and different epoxy resins, displaying novel structure, reactivity and curing characteristics, are described in a 24-page booklet. The booklet deals with physical properties of the Oxiron 2000 series and tells how these resins differ from conventional epoxies. The

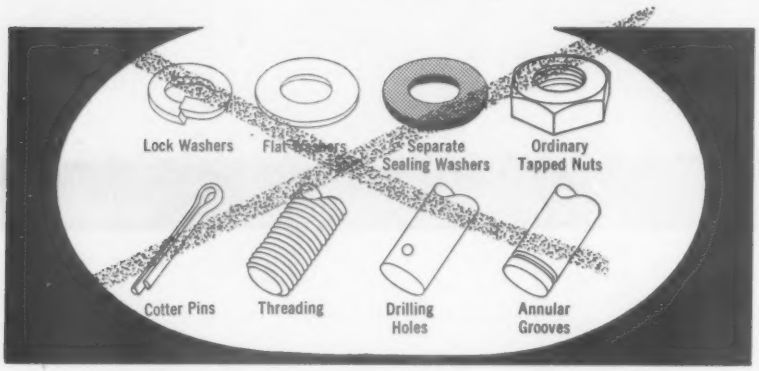
(See 55)

(See 56)

(See 57)

PALNUT® LOCK NUTS and FASTENERS *Eliminate*

one or more of these assembly parts or operations



–and provide compact, vibration-proof assemblies

PALNUT Lock Nuts for Threaded members

Spring tempered steel Palnuts, with the dependable double-locking thread form, are available in many stock types and sizes to meet practically any assembly need. Here are typical advantages:

- **Low cost**—less than other locking devices, often less than plain nuts.
- **Easy, fast assembly** with ordinary manual or power tools, extra fast with Palnut Magnetic Wrenches.
- **Save Parts.** One Palnut replaces 2, 3, even 4 parts according to application.
- **Save Space** by eliminating auxiliary parts.
- **Save Weight**—up to 85% reductions in fastener weight.
- **May be removed and re-used.**

FASTENERS for Unthreaded Studs, Rods, Pins, etc.

SELF-THREADING NUTS

Save threading costs. Form their own deep, clean threads while tightening on studs of any malleable material, including aluminum or zinc die-cast; also rods, shafts, wire or pins of steel, aluminum, brass or plastic. Fast assembly with standard tools. Vibration-proof grip, whether seated or unseated. Remove and reuse on same studs. Sizes for #6, #8, #10, #12 and ¼" dia. Write for Bulletin 585-A.

PUSHNUT® FASTENERS

Simply push on unthreaded studs, rod, wire or rivets. Strong spring grip resists removal. Save threading, grooving, drilling for cotter pins. Low in cost, fast assembly. Many types and sizes.

Write for literature and free samples, stating type, size and application.

THE PALNUT COMPANY
Division of UNITED-CARR Fastener Corp.
79 Glen Road, Mountainside, N. J.
Canada: P. L. Robertson Mfg. Co., Ltd., Milton, Ont.

PALNUT® LOCK NUTS and FASTENERS

Quick, secure fastening at low cost

Use postpaid card. Circle No. 239

data booklet will provide the necessary technical information for correct economic handling of these new and different materials. Epoxy Dept., Food Machinery and Chemical Corp., 161 42nd Street; New York, N. Y.

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THREAD-CUTTING SCREWS

How to eliminate separate tapping costs by using thread-cutting screws is told in a 32-page brochure. Engineering data on hole sizes, torque, all types of screw head specs are listed. Typical applications are illustrated. Power tool installation is also presented. Shakeproof Div., Illinois Tool Works, St. Charles Rd., Elgin, Ill.

Use postpaid card. Circle No. 63

DESIGNING FOR JOINTS

Information for designing aircraft and missile tubing and duct joints is contained in a 40-page catalog. Couplings for fastening and sealing hose assemblies, clamps, bands, straps and other products are specified and pictured. Marman Division, Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, California.

Use postpaid card. Circle No. 64

LOCK NUTS

Design engineers will be interested in a 12-page condensation of a 144-page catalog on various nuts. Standard, conical lock, 12-pointer, marsden and special lock nuts are illustrated and specified. National Machine Products Co., Utica, Michigan.

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BRASS CAP SCREWS

Hex head brass cap screws are quantity priced in a six-page mailing form. Ordering instructions are given and a return-envelope order form included. Champion Screw Co., 4200 N. Nordica Ave., Chicago 34, Ill.

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BREADBOARD COMPONENTS

Pocket-sized technical booklet No. 4 offers design hints and recommendations on effective use of mechanical breadboard components. PIC Design Corp., 477 Atlantic Ave., East Rockaway, New York.

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WIRE CLIPS

Trimclips—tempered high carbon wire fasteners—are introduced in a four-page brochure. Actual size pictures of some of the 300 variations developed for attaching moulding and trim are included. Samples. Gagnier Fibre Products Co., 10151 Capital, Oak Park, Mich.

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IT'S A FACT

YOU CAN DO BETTER WITH

DE-STA-CO

TOGGLE CLAMP DELIVERY

BECAUSE, with stocking Distributors from coast-to-coast, you can always get quick delivery of the right clamps for the work at hand . . . WHEN YOU NEED THEM!

Whatever the size or shape of the piece to be held—wherever you have to push, pull or lock with forces from 50 to 10,000 pounds—it's a hundred-to-one there's a DE-STA-CO Toggle Clamp in stock to fit the job exactly.

FOR YOUR NEARBY DISTRIBUTOR CONSULT YOUR YELLOW PAGES!

FOR MORE FACTS
CHECK BOOTH 1054
DETROIT TOOL SHOW

YOU CAN DEPEND ON DE-STA-CO

DETROIT STAMPING COMPANY
360 MIDLAND AVENUE
DETROIT 3, MICHIGAN

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BOLT FAILURE STUDIES

Why most tension bolt failures occur at the bottom or root of the screw thread is detailed in a 20-page research report. This root should be rounder, larger and better controlled, according to text, charts and photographs presenting the case for a new thread form. Standard Pressed Steel Co., Jenkintown, Pennsylvania.

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RATCHET WRENCH

An open-end wrench with a pawl which grips the nut and permits ratchet action is described in literature. It is particularly useful in assembly work where fluid and airline coupling connections are made. Columbia Products, Inc., 210 E. Lexington St., Baltimore 2, Maryland.

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SELF-LOCKING NUTS

A locking pin, built into the nut, travels between bolt threads. It assumes a fixed angle and sets up a point of impingement against the bolt. Thus, a secure anchorage against shock and vibration is maintained. A bulletin outlines advantages and provides illustrations. Automatic Nut Company, Lebanon, Pa.

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INSPECTION TABLES

A moving-belt table for inspecting parts and components is fed by a vibratory hopper. Photos and specs on several units are contained in a six-page brochure. Operating and maintenance instructions are also listed. G. F. Goodman & Son, 401 Richmond St., Philadelphia 25, Pa.

Use postpaid card. Circle No. 72

BLIND FASTENER LINE

A complete line of lock bolt fasteners is introduced in an attractive 24-page catalog. Driving cycles, strength data, applications, grip ranges, and other engineering information is included for each fastener: a range of blind rivets, self-broaching, self-sizing bolts. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Michigan.

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COATING PROCESS

A two-page engineering sheet (No. 4.5) describes the Nicrocoat process for oxidation corrosion and abrasion resistance. The data sheet discusses physical, chemical and fabrication properties of the surface protection provided by the process, covering application methods, thickness specifications and

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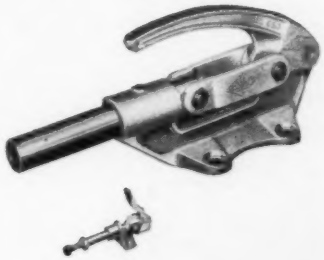
DE-STA-CO

TOGGLE CLAMPS



BECAUSE . . . whatever the size or shape of the workpiece you wish to hold—wherever you have to push, pull or lock with forces from 50 to 10,000 pounds—it's a hundred-to-one there's a DE-STA-CO Toggle Clamp to fit the job! And if not, our engineering staff will show you how easily one may be adapted! . . . 13 basic styles and over 140 models! Photo shows typical size range. . . . Complete template sets available.

FOR MORE FACTS
CHECK BOOTH 1054
DETROIT TOOL SHOW

YOU CAN DEPEND ON DE-STA-CO

DETROIT STAMPING COMPANY
360 MIDLAND AVENUE
DETROIT 3, MICHIGAN

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NOWHERE IN THE WORLD WILL YOU FIND SUCH A VARIETY OF FASTENERS UNDER ONE ROOF

EYELETS, RIVETS, GROMMETS, WASHERS, HOLE PLUGS
SNAP FASTENERS, FERRULES, TERMINALS, STAMPINGS

and many similar fasteners are made in enormous variety and quantity. Made from most any metal and in all finishes. We also make a complete line of machines for attaching eyelets, rivets, etc.

Send for our general catalog which illustrates over 1000 metal articles.

84 FRANKLIN AVENUE EDWIN B. 84 FRANKLIN AVENUE
STIMPSON
BROOKLYN 5, N.Y., U.S.A. COMPANY. BROOKLYN 5, N.Y., U.S.A.

84 FRANKLIN AVENUE, BROOKLYN, N. Y.

Use postpaid card. Circle No. 262

fusing procedures. Stainless Processing Div., Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich

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BLIND RIVETS

Five years of experience in fastening with Pop blind rivets is compiled in eight-page Bulletin SL-101. Selecting proper types for specific applications and how to order through a new coding system are dealt with. Power installation tooling is also pictured and specified. Pop Rivet Division, United Shoe Machinery Corp., Shelton, Conn.

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SLIP-ON FITTINGS

Slip-on fittings simplify the assembly of railings, shelving, racks by eliminating threading or welding. An eight-page bulletin describes and specifies the five basic types. Illustrated. The Hollaender Mfg. Co., 3841 Spring Grove Ave., Cincinnati 23, Ohio.

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LOCK BOLTS

Commercial lockbolting in the transportation, building, machinery and equipment and railroad industries is presented in an eight-page bulletin. Step-by-step installation features, blind fastener specifications and power tooling are pictured and described. Townsend Co., New Brighton, Pa.

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ASSEMBLY PRESSES

New model assembly presses are emphasized in 24-page Bulletin 120-F. Cutaway and dimensional drawings illustrate the Multipress. Specifications and performance characteristics are listed for each press. Case history photos are included. Denison Engineering Division, American Brake Shoe Co., 1160 Dublin Rd., Columbus 16, Ohio.

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RETAINING RING PLIERS

Twelve types of pliers, each with a permanent tip for a specific Truarc retaining ring, are specified in four-page Catalog 5936. Industry applications for each type are charted and advantages of permament tips cited. Proto Tools, 2209 Santa Fe Ave., Los Angeles 54, California.

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SOLDERING TOOLS

Tools for resistance soldering are pictured and specified in 16-page, hard-cover Catalog 21. Power units, electrode holders and accessories are priced. The Luma Electric Equipment Co., P. O. Box 132, Toledo 1, Ohio.

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GRAVITY CONVEYOR

Helpful information on how to select, install, service, specify roller conveyors for assembly lines is contained in 12-page Bulletin RR-58. Designed to handle palletized, packaged, bagged materials, the conveyors are shown in typical uses. Engineering specifications are listed. The Rapids-Standards Co., Inc., Rapistain Bldg., Grand Rapids 2, Mich.

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VIBRATION MOUNTS

Vibration mounts employing the principle of "rubber-in-shear" to provide vibration isolation and acoustics control are presented in a revised eight-page bulletin. Diagrams and tables, prices and instructions for computing type, size and number of mounts needed to handle the weight load of a given installation are included. Rexon Mount Division, Hamilton Kent Mfg. Co., Kent, Ohio.

Use postpaid card. Circle No. 82

SPRINGS

Compression, torsion and extension springs of all types are manufactured with facilities sketched in a four-page brochure with photos. A customer list is included. Specification maximums are charted. Rockford Spring Co., 1500 13th St., Rockford, Ill.

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COLORED SCREWS

Screws colored to match end products are offered either entirely painted or with only screw heads painted. A four-page folder outlines services available, including plated, bonderized and baked enamel finishing. Great Lakes Screw Corp., 13631 S. Halsted St., Chicago 27, Illinois.

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AIR CYLINDERS

Design features of four series of square-type air cylinders are pictured and discussed in cross-sectional drawings. The 24-page catalog (SA7) also shows various model mount for each series from 1½" to 10" bores. A standard rod pressure chart is included. Lynair Inc., 3100 E. Michigan, Jackson, Michigan.

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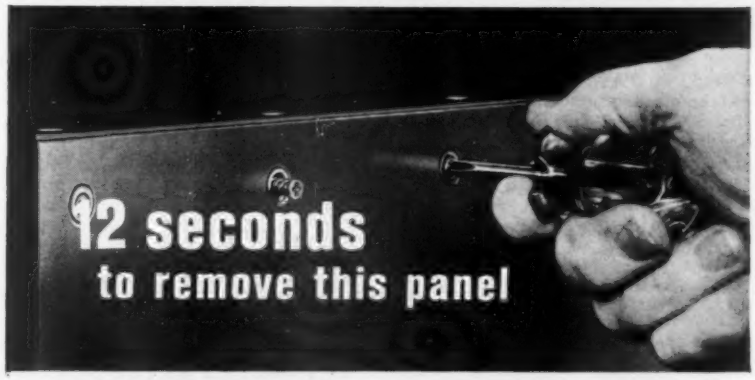
PHOTOELECTRIC CONTROL

Bulletin GEA-6822, 16 pages, describes a full line of controls for industrial counting, sorting, signaling, protecting, diverting, detecting, or limiting jobs. Included are descriptions, specifications, and pricing data on many relays, smoke-density indicators, electronic timers, cut-off register controls, and other electronic devices. General Electric Co., Schenectady 5, N.Y.

¼-TURN FASTENERS



VERSUS SCREWS

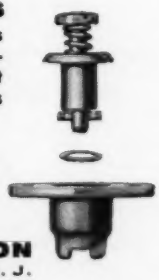
Designed To SAVE YOU Time

CAMLOC ¼-TURN FASTENERS

The odds are in your favor by 5½-to-1 when you design-in Camloc ¼-turn fasteners. By actual test, you save that much time—compared to screws—in removal and replacement of these panels. What's more, there are no loose parts – Camloc fasteners are "captive" in the mating panels. By all odds, Camloc ¼-turn fasteners cost you less to use, save you time, save you effort in fabrication and service. Millions of fasteners in use today are proof of their outstanding, money-saving qualities. Write today for Catalog.

SOME TYPICAL APPLICATIONS

Aircraft Panels • Electronic Sub-assemblies • Railroad Cars Heavy Machinery • Lighting Fixtures • Missiles • Automotive Equipment • Television Studio Equipment • Transit Cases • Business Machines • Consoles • Collapsible Units



CAMLOC

"Specialists in Fasteners for Industry"

CAMLOC FASTENER CORPORATION
14 SPRING VALLEY RD., PARAMUS, N. J.
LOS ANGELES, CALIF. • FT. WORTH, TEXAS

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breadboard components. Photos illustrate assembly of clamps, tee nuts and other stocked items. PIC Design Corp., 477 Atlantic Ave., East Rockaway, L.I., N.Y.

Use postpaid card. Circle No. 86

DRILL & TAP MACHINE

Guaranteed production rates for the Model 408 Beco drill and tapper are listed for various metals. A four-page brochure pictures the unit's operation, details clamping, feeding, locating, escapement and typical applications. Machine specifications are given. Batchelder Engineerng Co., Springfield, Vermont.

Use postpaid card. Circle No. 87

COLD HEADED STANDARDS

Samples of standard screws, nuts, bolts and sems and cold headed special parts are pictured in a 12-page bulletin. Facilities for producing these parts and an introduction to aircraft and automotive hardware divisions are included. Midland Screw Corp., 3638 S. Kedzie Ave., Chicago 32, Ill.

Use postpaid card. Circle No. 88

VIBRATORY FEEDERS

Vibratory feeders and unit vibrators designed especially for hazardous, dusty locations are pictured and described in a two-page flyer. The electro-permanent magnetic units are accepted by Mill Mutual Fire Prevention Bureau. Eriez Mfg. Co., 95 Magnet Dr., Erie, Pa.

Use postpaid card. Circle No. 89

ELECTRIC WELDERS

Resistance welding for mass production economies is the theme for a four-page house organ. "Weld-It" traces through photos the assembly of the Briggs and Stratton engine through welding. Taylor-Winfield Corp., Warren, Ohio.

Use postpaid card. Circle No. 90

AUTOMATED METAL HEATING

Induction heating equipment for automated metal heating for brazing and soldering is presented in a four-page folder. Design, manufacturing and service facilities are also introduced. Motor generator sets, control stations are pictured and explained. Robotron Corp., 21300 W. Eight Mile Rd., Detroit 19, Michigan.

Use postpaid card. Circle No. 91

STAINLESS ELECTRODES

Choosing the correct stainless steel electrode and maintaining proper procedure are the topics dealt with in four-page Bulletin R-49. A chart lists the chemical range of deposited weld metal, as well as mechanical properties and color code. Twenty-one electrodes are described. Harnischfeger Corp., 4400 W. National Ave., Milwaukee 46, Wis.

Use postpaid card. Circle No. 92

PLASTIC PARTS CUP

Plastic parts are pictured separately and tiered in racks in a one-page flyer. Dimensions of the four styles available and construction features are supplied. Hollywood Plastics, Inc., 4560 Worth St., Los Angeles 63, Calif.

Use postpaid card. Circle No. 93

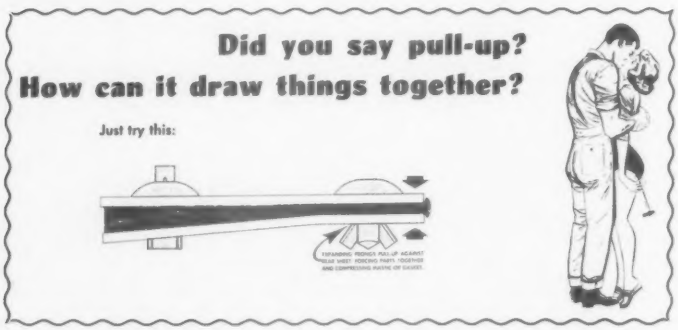
ELEVATING FEEDERS

Elevating feeders for automatic feeding and orienting of parts to assembly or processing machinery are described in four-page folder No. 2812. Details of construction and dimensions on standard 6, 12 and 20 cu. ft. feeders are given. Illustrated. Detroit Power Screwdriver Co., 2801 W. Fort St., Detroit 16, Michigan.

Use postpaid card. Circle No. 94

"SHOP TIPS ON BLIND RIVETING"

An editor's review of a somewhat technical manual used in a course taught by Susie



PRENED-OVER METAL FROM RIVET HEAD HOLDS PIN IN PLACE.
RIVET BODY METAL, DISPLACED BY RAISED EDGES, FLOWS INTO PATENTED GROOVES.
PRONGS GRIP PIN FROM BOTTOM.
TIGHTLY LOCKED PIN CAN'T COME OUT. RIVET CAN'T LOOSEN WHILE PIN IS IN PLACE.
"Here is the key"

An educational booklet on fastening applications can also be entertaining, as is evidenced by the popularity of "Shop Tips on Blind Riveting". (Reading time of the booklet is only three minutes—if you don't stop to admire the teacher.)

This comic-strip size booklet features Susie Southco in the role of a teacher. However, despite all the technical details presented in her lectures, it is obvious to the reader that she would much prefer to have the course entitled, "Riveting Is A Man's Job". So both titles appear on the frontispiece of the manual.

Some of the illustrations in the 16-page booklet are presented herewith to prove that this is a technical manual despite the engaging mannerisms of the teacher. But you have to admit that she makes the subject most attractive.

If you desire your own personal copy, just drop a note on company letterhead to Susie, c/o Assembly and Fastener Engineering, Wheaton, Illinois

PUSH-IN INSERTS, STUDS

Knurled studs and inserts which are pressed into soft metals, plastic parts or wood are introduced in a one-page bulletin. Assembly savings are outlined. Drawings illustrate installation procedure. Fastener Products, Inc., 349 Connecticut Ave., Norwalk, Conn.

Use postpaid card. Circle No. 95

WIRE FORMS

Special wire forms and metal stampings are cataloged in 10-page brochure 102. Tips on designing and specifying wire parts are offered. A wire gauge chart is suitable for posting. Merrill Mfg. Corp., Merrill, Wis.

Use postpaid card Circle No. 96

RATCHET WRENCH

A ratchet wrench designed for making up fittings of all types, tightening machine nuts and hex fasteners is introduced in a one-page flyer. Features, specifications and aid in choosing the right model for types of fittings are included. The Imperial Brass Mfg. Co., 6300 W. Howard St., Chicago 48, Ill.

Use postpaid card. Circle No. 97

SNAP-IN TERMINAL BUSHING

Miniature nylon-insulated receptacles for use with standard solderless wire terminals are featured in an illustrated two-page punched sheet. Six snap-in types are shown and prices listed. Heyman Mfg. Co., Kenilworth, N.J.

Use postpaid card. Circle No. 98

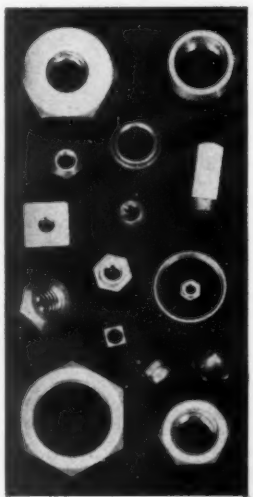
Grippe, Susie?

No, **GRIP**. The grip of a blind rivet is the total thickness of sheets that a particular length rivet will fasten properly.

Example:

Part No. 38-106-04-11

Diameter = 3/16" (6/32") | Grip = 1/8" (4/32")



AS SPECIALISTS IN PRECISION NUTS ... both brass and aluminum ... we can help resolve your fastening or assembly problems by supplying *uniformly accurate turned nuts to your exact specifications.* To date, we have furnished more than 3,457 different types of special or odd size nuts, including miniatures, to customers making widely diversified products. Their satisfaction with our over-all performance is eloquently confirmed by repeat orders ... plus orders for new items!

As the leading producer of turned nuts, we specialize in reliable "on schedule" deliveries and competitive pricing in addition to premium quality. That is why you get better service ... faster ... from Fischer.

FOR DETAILS, WRITE FOR CATALOG FS-1000 AND PRICE LISTS.

there's no premium for precision at

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FISCHER SPECIAL MFG. CO.

496 Morgan Street Cincinnati 6, Ohio

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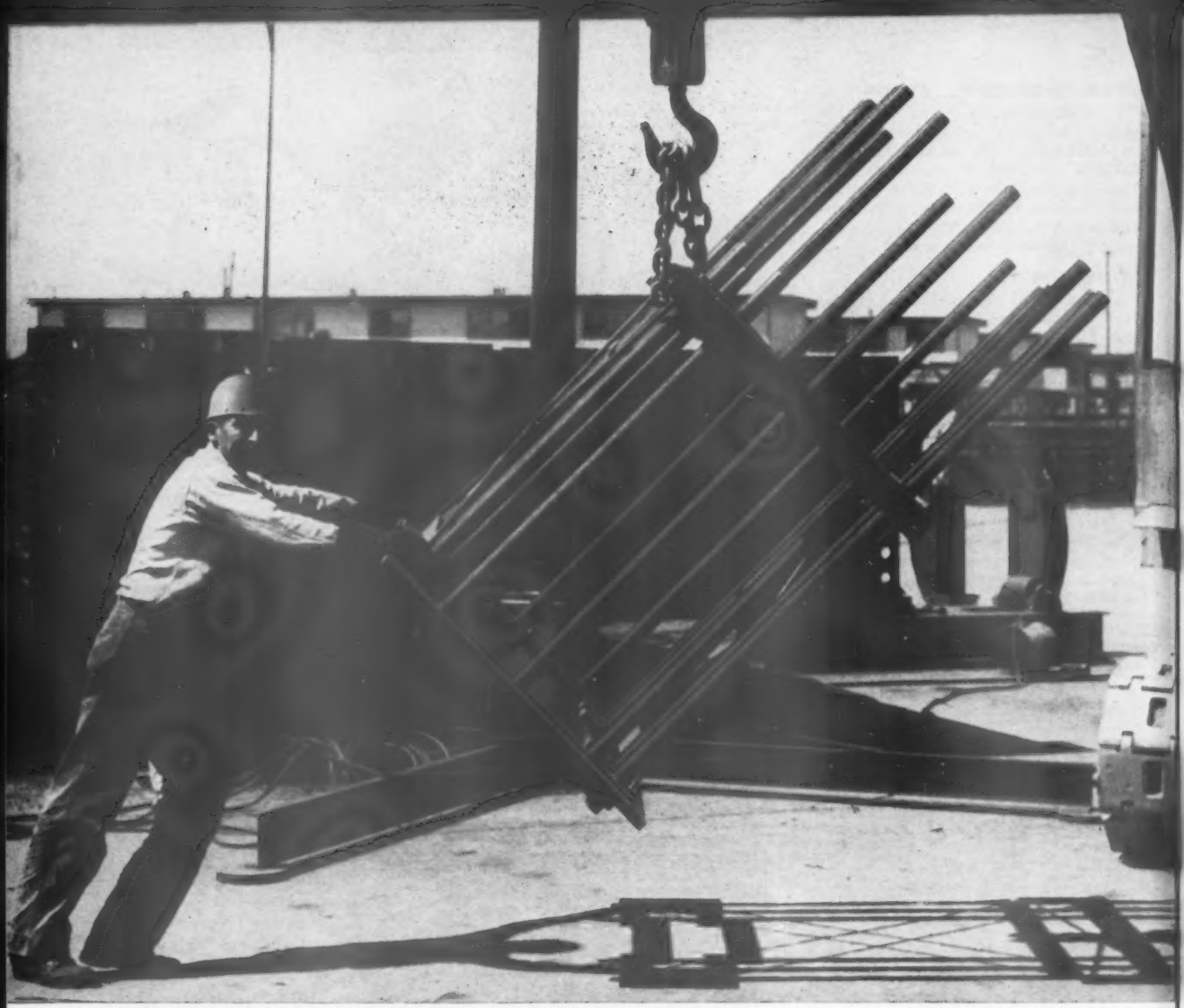
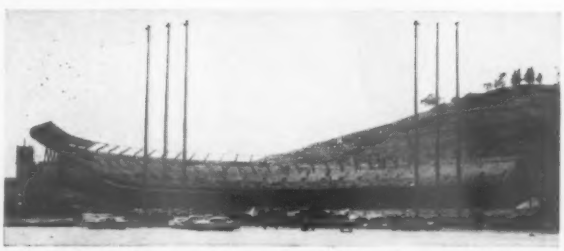


Big bolts for the Giants' ball park

Threaded foundation bolts, two inches in diameter and eight feet long, 14 of them in all, were welded into this mammoth cage. This section will be embedded in concrete as an anchor for one of several steel shafts supporting the lighting system for the San Francisco Giants' new Candlestick Stadium.

The range of Bethlehem standard fasteners is wide enough to handle most bolting requirements. But quite often a special job, such as this one, calls for a special fastener designed to meet the specific need.

We can make an almost unlimited variety of special fasteners. Just send us a pencil sketch or drawing. Our fastener engineers will study it; and perhaps they can recommend changes that will save you money. We're equipped to give you prompt action. For full details, get in touch with our nearest sales office.



Candlestick Stadium, the new home of the San Francisco Giants

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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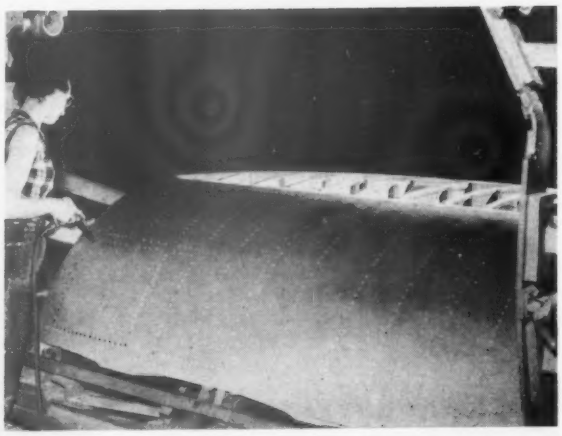
Assembly and Fastener Engineering

INDUSTRY MAKES NEWS



Boeing has turned to titanium rivets for fastening four wheel well doors in the B-52G. The exotic metal weight savings offset higher cost.

Members of the Screw Research Association committee present at the January meeting, from left to right, R. Mark DiFruscio, Screw Research Assoc.; Ken Ringland, Central Screw Co.; Harry Jones, Steel Company of Canada; E. Tauscher, Pheoll Manufacturing Co.; Alan Barclay, Steel Company of Canada; Marshall Hammond, Wrentham Steel Products Co.; Fred E. Youngdahl, Wrentham Steel Products Co.; Frank J. Washabaugh, American Screw Co.; Herman G. Muenchinger, American Screw Co.; Cyril Smith, Linread, Canada, Ltd.; Louis Cummaro, Screw Research Assoc.; John J. Simko, National Screw & Manufacturing Co.; Harvey Erdmann, National Screw & Mfg. Co.; Art Breed, Lamson & Sessions Co.; Vincent Mottola, Screw Research Assoc.; Ed Locke, Continental Screw Co.

NEW STANDARDS FOR PHILLIPS SCREWS

The Screw Research Association has formed a sub-group of the Phillips Recess Engineering Committee to set new standards of quality for Phillips screws. The present committee met in Boston, January 27-28, to discuss, evaluate and prescribe the new quality standards.

These standards are designed to establish a higher quality level; controlling such things as fractured heads, recess and head eccentricity, bit life and recess penetration depth. This new method of quality control and allowable tolerances for gauging Phillips screws will assure customers of uniform quality.

The committee was addressed by F. P. Whalen and C. Canney of American Steel and Wire Co. and W. C. Clements of Bethlehem Steel Co. on the subject of cold heading wire.

BOEING B-52G USES TITANIUM FASTENERS

One of four wheel well doors for a Boeing B-52G aircraft has titanium hardware driven into it for a substantial savings in weight. Replacing steel rivets and bolts previously used in the doors, the titanium fasteners provide a weight savings of 40%.

The opportunities for heavier payloads and increased operating range for the aircraft are judged to offset the price differential between the two fastener materials. One type of titanium high-shear rivet used costs $.89; its equivalent steel rivet costs $.05 according to Aeronca Mfg. Corp., who produced the doors in its Middletown, Ohio, plant. A type of titanium bolt used costs $2.69. Aeronica reports that 1856 pieces of titanium hardware go into a set of wheel well doors. Total weight of the pieces is 6.51 lbs., as opposed to 11.58 lbs. for steel.

NEWS ON THE DESIGN ENGINEERING CONF.

The Design Engineering Conference, sponsored by the machine design division of the ASME, will relate advanced engineering research to the problems of design in American industry.

The conference is set for the New York Coliseum, May 23 to 26, simultaneous with the Design Engineering Show. The show will cover four floors of the Coliseum and exhibit the products of 400 companies.

continued

The opening conference session, "New Horizons in Engineering Design," will set the theme for the conference with a panel of outstanding scientists from the space and atom fields. They include Dr. Hugh L. Dryden, of the National Aeronautics & Space Administration; Dr. Arthur R. Kantrowitz, Avco-Everett Research Laboratory; William R. Gall, Oak Ridge National Laboratory; Varick D. Schwartz, Army Boiling Water Reactor Project; George P. Sutton, Advanced Research Projects Agency, and Elmer P. Wheaton, Douglas Aircraft Co.

Another session will consider how computers are to be used in design. Experts from Socony-Mobil Oil, Worthington, General Electric, General Motors and Republic Aviation will participate.

Reliability of components is the subject of considerable study in the missile field and two authors will present papers on how reliability prediction can be applied to the general design field.

Among other subjects, drawn from the space and atom fields and related to ordinary industry, will be control systems, automation, hydraulic systems under extreme pressures, high strength steels and non-metallic structural materials, new welding processes, part fabrication by explosives, and the like.

Visitors who want information about the conference, show, hotel reservations or rapid registration cards should write Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y.

NEW AIR TOOL PLANT FOR MASTER POWER

A 14-acre tract of land on Cochran Road in Solon, Ohio, has been purchased to provide new manufacturing facilities for the Master Power Corporation, subsidiary of The Black & Decker Mfg. Co. Contracts have been awarded to The Austin Company of Cleveland for the construction of a modern one-story factory and office building containing a total of 50,400 square feet. The entire project will cost approximately $700,000.

FASTENER SHIPMENTS RISE IN JANUARY

Industrial fastener shipments continued to rise in January with seasonally adjusted figure of 149. This is three percentage points over the 1959 year average.

The index was at its highest point since July 1959's 165. Past January marks have been: 1959—140; 1958—133; 1957—173; 1956—166. The base figure of 100 is an average of shipments between 1947-49, as compiled by the Industrial Fasteners Institute.

WATERBURY FARREL APPOINTS VICE-PRES.

Waterbury Farrel Foundry & Machine Co., Division of Textron Inc., has announced the appointment of Arthur S. Nippes as a vice president.

Nippes was previously consultant to the president of Simonds Saw & Steel Company, Fitchburg, Mass. and vice president and general manager of Disston Division of H. K. Porter Co., Pittsburgh. He is a graduate of Pennsylvania State College in mechanical engineering.

AIRTEK MOVES PLANT, ELECTS PRESIDENT

Airtek Dynamics, Inc., Los Angeles, which recently elected Robert F. Goodwin its new president, will move into a 65,000 sq. ft. plant in Compton, Calif. The transfer will bring together the manufacturing operations of Airtek and its two divisions Research Welding and Engineering and Crest Marine Hardware.

Goodwin was formerly vice president for manufacturing and succeeds G. G. Michel, now chairman of the board. He joined Airtek in 1956 as works manager after previous experience in executive and engineering positions with General Metals Corp., George H. Elliott & Co., the Martin Co. and Pratt and Whitney.

Free Sample Tube

Industry's NEWEST Production TOOL

MOLYKOTE® G LUBRICANT

- ALMOST 100% SAFETY AGAINST GALLING AND SEIZING WITH ALL BEARING METAL COMBINATIONS
- ELIMINATES STICK-SLIP, METAL PICK-UP AND DISTORTION IN PRESS FITTING
- REDUCES WEAR-IN TIME AND DAMAGE IN NEW OR REBUILT MACHINERY
- THE HIGHER THE LOADS, THE GREATER THE MARGIN OF SUPERIORITY OF MOLYKOTE G

Write for your free sample of MOLYKOTE G LUBRICANT today. We will also send you a copy of our new Bulletin 126 which gives complete details. THE ALPHA-MOLYKOTE CORPORATION. 65 Harvard Avenue, Stamford, Conn. Phone Fireside 8-3724. Plants in Stamford, Conn., Munich, Germany and Strasbourg, France.

THE ALPHA-MOLYKOTE CORP.
65 Harvard Ave., Stamford, Conn.
Please send me a free sample of your MOLYKOTE G Lubricant.
NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

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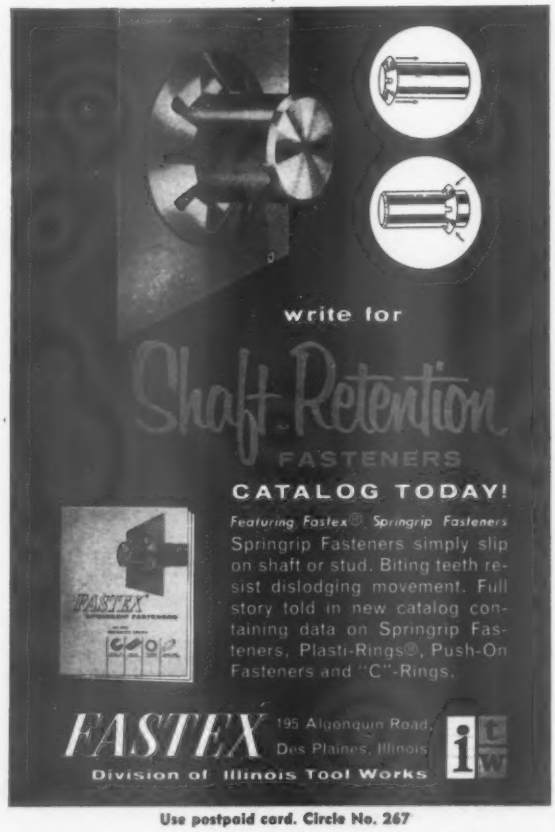
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Shaft Retention
FASTENERS
CATALOG TODAY!
Featuring Fastex® Springrip Fasteners
Springrip Fasteners simply slip on shaft or stud. Biting teeth resist dislodging movement. Full story told in new catalog containing data on Springrip Fasteners, Plasti-Rings®, Push-On Fasteners and "C"-Rings.
FASTEX
195 Algonquin Road, Des Plaines, Illinois
Division of Illinois Tool Works

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BOEING DEVISES NEW BLUEPRINT FORMAT

The blueprint, vital communication link between design engineer and manufacturer, is undergoing a radical change in its traditional format at Boeing.

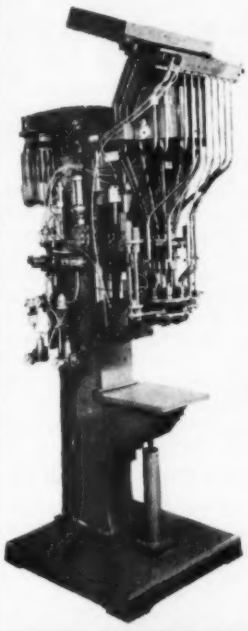
A series of cost studies made by the Transport Division's methods and systems committee, showed that changing the blueprint structure would save time, material and paperwork and make information more readily available.

It was found that in many cases, blueprint users required only the "picture" part of the blueprint. Others, such as cost accountants and buyers acquiring material, required only the written data. In the streamlined blueprint version, the "picture" print remains the same. But the written information will be documented in handy looseleaf folders which are easier to handle, both in carrying and in seeking specific data. Both sets of documents will be available—in separate packages but under the same identification number—and users will draw only the information for a specific job.

Changes, the bugaboo in the blueprint business, are cranked in easily. Changing informational data involves replacing pages in the looseleaf folders. For "picture" blueprints, changes will continue to be attached until it is economical to reprint the drawing.

continued

this machine will drive up to 10 screws at one time . . .



. . . reducing assembly costs and improving quality. Built for high production jobs where a fixed set up is practical, this multiple spindle screw driving machine automatically feeds screws from a hopper and drives them to a predetermined torque. Evenly distributed pressure eliminates stresses caused by driving home one screw at a time. A simple sliding fixture positions work pieces accurately.

Machine illustrated shows application of multiple spindle screwdriving to assembly of electric power drills.

Send a sample of your assembly and a list of your requirements. We will be happy to show you how multiple spindle screw driving can be applied to your job.

COOK & CHICK COMPANY
2415 West 24th Street Chicago 8, Illinois

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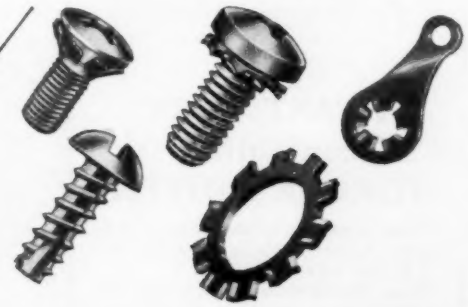

Togetherness

matters with industrial fasteners, too!

Togetherness, industrial style, has a special meaning at Thompson-Bremer because we are one of the few fully integrated manufacturers of Sems, lock washers, thread-cutting screws, terminals and cold-headed specialties. With our engineering services and components manufacturing together under one roof, we can give you faster, more individualized service at competitive prices. We'll bid on your specials requirements, or fill orders for standard items on short notice from the extensive line of EVERLOCK products stocked by your local distributor.

If you buy or specify industrial fasteners, you want whatever your company assembles to go together economically and stay together reliably. Send for catalog and samples or call your EVERLOCK representative.

AMF Everlock INDUSTRIAL FASTENERS

Thompson-Bremer & Co.
Division of
American Machine
& Foundry Company

Thompson-Bremer & Co., Dept. 21
228 N. LaSalle St., Chicago 1, Ill.
Please send me:
_____EVERLOCK fastener catalogs_____samples of EVERLOCK industrial fasteners and cold-headed specialties.
Name_____Title_____
Company_____
Street_____
City_____Zone___State_____

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The new blueprint format will be applied only to new projects as they develop. Blueprint procedures for existing projects will, in the main, not be changed.

The photo shows a comparison of cumbersome sheets of blueprint information formerly necessary and the small easily handled handbook used in the streamlined plan.

DEPENDABLE ACME MOVES PLANT

Dependable Acme Threaded Products, Inc., Brooklyn, N.Y., is moving into a modern building providing 6000 square feet increased production facilities for the Threading Division.

LEACH TO DIRECT OMARK-GRAHAM SALES

Austin F. Leach has been appointed manager, stud welding sales, at Omark Industries, John D. Gray, President of the Portland, Oregon firm, announced. Leach will direct sales activity for the firm's Omark-Graham stud welding line.

Leach brings to his new job extensive experience with the welding department of General Electric. When G.E. discontinued its welding line, he joined the A. L. Smith Iron Co., Cambridge, Mass., where he was manager of manufacturing and engineering.

NYLOK-DETROIT BOOSTS OUTPUT CAPACITY

Nylok-Detroit Corp., manufacturers of threaded fasteners, announced development and installation of new special automatic processing and finishing machines which have resulted in a 50% increase in productive capacity of its Troy, Mich. plant.

Designed and built by Ebbert Engineering Co., the new machines are reportedly the first ever made capable of applying locking-sealing nylon pellets to any type or size of threaded part in both long and short production quantities on an efficient, economical basis.

HANNIFIN NAMES TOPINKA CHIEF ENGIN.

George F. Topinka has been named chief engineer, Power Cylinder Division, Hannifin Company, Des Plaines, Ill., a division of Parker-Hannifin Corp.

Topinka joined Hannifin from the Borg and Beck Division of Borg-Warner Corporation where he was administrative engineer in charge of new product design and development. He holds a BSME degree from Purdue University and an MBA Degree from the University of Chicago.

LIFSCHULTZ LOWERS FREIGHT BOLT RATE

Lifschultz Fast Freight has reduced rates 31% on quantity shipments of certain iron and steel bolts between New York and Chicago.

The new rate, applying to shipments of 32,000 or more pounds, is $1.07 per 100 pounds, compared with the old rate of $1.56. The freight forwarder said that it covers iron and steel bolts, which are plain, galvanized, japanned, painted, tinned or coated with brass, bronze, copper, lead, zinc, or cadmium.

KENNEDY HEADS THOR CLEVELAND BRANCH

Paul J. Kennedy, an 18-year veteran of the Thor organization, has been named district manager of the new Cleveland sales and service branch of Thor Power Tool Company, Aurora, Ill. replacing Robert J. Grace, recently appointed Chicago district manager.

Kennedy has been a Thor sales and service engineer at the Toronto (Canada) branch, working with industrial, automotive service, mining, and contractor tool distributors.

For torqueing problems USE the

New

"TITANTORKER"

controlled

TORQUE DRIVER

"TITANTORKER" makes controlled power torque available for a variety of torque uses—at low cost.

When desired torque is reached an audible signal is given as the internal driving balls are forced out of their sockets and overrun.

EASY ADJUSTMENT—For increased or decreased torque, "TITANTORKER" can be simply adjusted with an Allen wrench.

"TITANTORKER" can be used with any motive power except impact wrenches. Is ideal for most controlled power torque problems due to ease of adjustment and maintenance.

Available in 4 sizes in maximum torques from 75" lb. to 225' lb., with Female Adapters in driving head and Male Adapters on torque base.

Write for details and prices

TITAN TOOLS

World's Largest Producers Of Stud Drivers And Pullers

TITAN TOOL CO.

47 MAIN ST., FAIRVIEW (ERIE COUNTY), PA.

Use postpaid card. Circle No. 270

Available in Stainless Steel, Silicon Bronze, Brass, Aluminum and Steel

JACOBSON NUT MFG. CORP. Kenilworth, New Jersey

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MOGENSEN LAUDS MAYTAG PROGRAM

Dale Myers (second from right) and Frank Fisher (right) were among 20 supervisors cited by Maytag for cost reduction activities. Allan H. Mogensen (left) and president Fred Maytag III make the awards.

Increased participation by both manufacturing supervisors and employes in the Maytag company's work simplification program during the past year was termed by company officials as instrumental in achieving savings of more than a million dollars for the third consecutive year.

Cost reduction attained in Maytag's 1959 program totaled $1,026,041.92, it was reported at the annual work simplification program held in Newton this week.

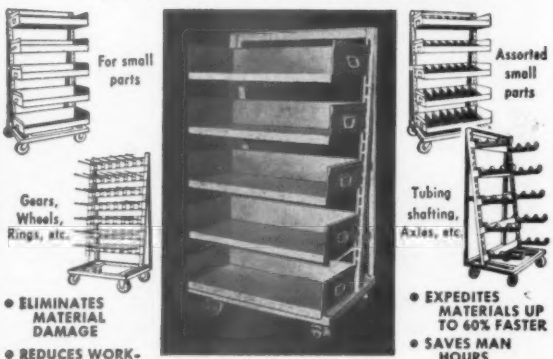
This brings to nearly six million dollars the total cost reduction achieved since the program was initiated at the appliance firm in 1949.

Guest speaker at the program, Allan H. Mogensen, a pioneer in the field of work simplification, lauded the three major objectives of Maytag's program for 1960—to further increase participation, improve product quality and expedite processing of ideas.

continued

THE VER-T-RACK

THE ACME OF VERSATILITY



- ELIMINATES MATERIAL DAMAGE
- REDUCES WORKER FATIGUE
- MAXIMUM EFFICIENCY AT MINIMUM COST

HEIGHT—65½" LENGTH — 35"
WIDTH— 24" CAPACITY 2000 lbs.

- EXPEDITES MATERIALS UP TO 60% FASTER
- SAVES MAN HOURS
- SAVES FLOOR SPACE
- GREATER SAFETY FACTOR

Equipped with 6" roller bearing steel wheel casters

VER-T-RACK can be handled with lift truck.
Trays are adjustable on **VER-T-RACK**

PRICE — $49.50 Varied Accessories Extra

Slightly higher west of the Rockies Write today for descriptive literature

THE Vince BASNIK COMPANY
MATERIAL HANDLING DIVISION
2020 CENTER STREET • CLEVELAND 13, OHIO

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COLD-HEADED INTAKE VALVE

Lower in cost . . . better by test . . .
Engineered by NATIONAL LOCK

A leading manufacturer of lawn mower engines came to us with a challenge . . . to make a *cold-headed* intake valve that would cost less and outlast its forged predecessor. National Lock engineering and production specialists worked as a team. Our metallurgists tested and specified the metals that were superior in strength and free from structural defects. Production then determined the most efficient, economical methods of making the valve in volume. Results: The finished product IS low in cost, better by endurance test! AND NATIONAL LOCK IS THE FIRST MANUFACTURER TO PRODUCE COLD-HEADED INTAKE VALVES . . . another example of our engineering ability and production versatility. National Lock fasteners and cold-headed products can be designed to *your* specific requirements and engineered to cost you less. Write us.

QUALITY STANDARD AND SPECIAL-PURPOSE FASTENERS AND COLD-HEADED PRODUCTS

NATIONAL LOCK COMPANY
FASTENER DIVISION Rockford, Illinois

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To be successful, he said, work simplification's philosophy must be understood from top management on down. This involves consultative management and widespread participation leading to a change in attitude in favor of teamwork.

Certificates were presented by president Fred Maytag to the past year's 20 top supervisors for their outstanding contributions to the cost reduction program.

AERO SUPPLY FINANCES INT'L ULTRASONICS

Acquisition of an interest in International Ultrasonics, Inc., Rahway, N.J., by Aero Supply Mfg. Co., Inc., Corry, Pa., has been announced by Thomas J. Scarpa, president of International Ultrasonics. The agreement includes options for Aero to acquire up to 50% of International Ultrasonics.

Scarpa said Aero will assist in financing production of a new ultrasonic continuous seam welder for aluminum foil and other thin metals. The first such unit will be installed soon at the Richmond, Va., foil plant of Reynolds Metals Company. Scarpa said the unit is capable of welding aluminum foil as thin as .00025".

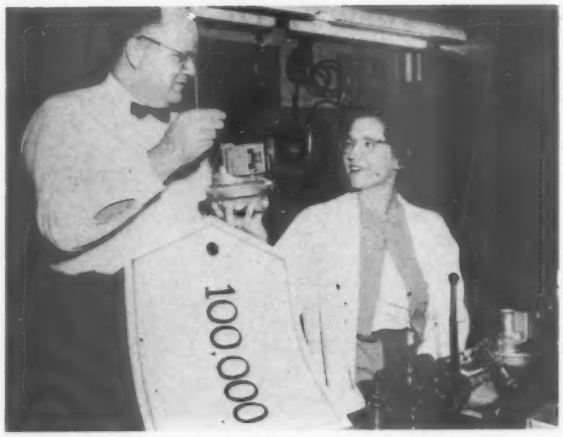
STANLEY-HUMASON MAKES SALES CHANGES

Two new sales organization appointments have been announced by Stanley-Humason, Inc., Forestville, Conn., a subsidiary of The Stanley Works.

LENA

ORR

Alphonse C. Lena will cover Vermont, western Massachusetts and parts of Connecticut and Rhode Island. He has been with the company since 1953. James B. Orr will succeed Lena as New England sales service correspondent. He has been operating assistant to the Stanley Chemical sales manager for five years.



Travis Wade, foreman, and Jo McLain, gas valve assembler, look over the 100,000th combination gas valve produced at G-E's Tyler, Texas Central Air Conditioner plant.

WIESNER DIRECTS RHEEM QUALITY CONTROL

Sidney Wiesner, an advanced researcher in the field of the reliability of semiconductor devices, has been named to the position of quality control manager for Rheem Semiconductor Corporation, Mountain View, Calif., announced Dr. E. M. Baldwin, vice president and general manager.

Mr. Wiesner has had 18 years experience in electronic research and manufacturing. For the past two years, he has been director of quality control for General Transistor Corporation, Jamaica, N.Y. He directed quality control departments for a number of other electronics manufacturing companies in New York and New Jersey.

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brings you the latest facts about fastening with rivets . . . tells you how and why riveting speeds assembly at lower cost.

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ESNA TO RESTYLE BRAND MARK

Elastic Stop Nut Corporation of America of Union, N.J. announced that all of its products, including a variety of non-fastener lines, hereafter will carry the word "ESNA" in a red circle and a hexagon silhouette. Concurrently, some of its divisions and departments which in the past have operated under other names now will be restyled.

The designation "A'G'A", the familiar abbreviation for American Gas Accumulator Company which was merged with ESNA in 1952, will be abandoned.

PROGRESSIVE WELDER CHANGES NAME

A consolidation of all Progressive Welder properties has been voted by the board of directors. The new corporation will be known as Progressive Welder & Machine Company, with corporate offices in Detroit.

The consolidation was accomplished upon the settlement of the estate of the late Fred H. Johnson, founder of the company and well known pioneer in the resistance welding field. The new corporation will retain the same personnel and facilities as before.

STERLING BOLT MARKS 40TH ANNIVERSARY

In 1913 a reporter for the Indianapolis Sun, whose normal beat was police, was sent on an interview for the business page. And this chance assignment led to the formation of today's Sterling Bolt Company, with its eight divisions and over 400 people employed, marking its 40th anniversary in 1960.

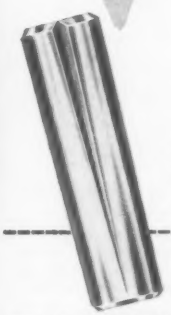
Charles C. Gordon was then assigned to find out whether George Levene was going to continue manufacturing the American underslung car in Indianapolis. When he learned that the firm wanted to liquidate its fastener inventory he asked for the job.

"I was able to dispose of the inventory myself, and decided that the distribution of screws, nuts and bolts was the business for me," Gordon, now chairman of Sterling's board, says.

continued

have you checked

DRIV-LOK PIN *advantages?*



1. **Positive anchoring . . . once in they *stay in* . . . yet they're re-usable**
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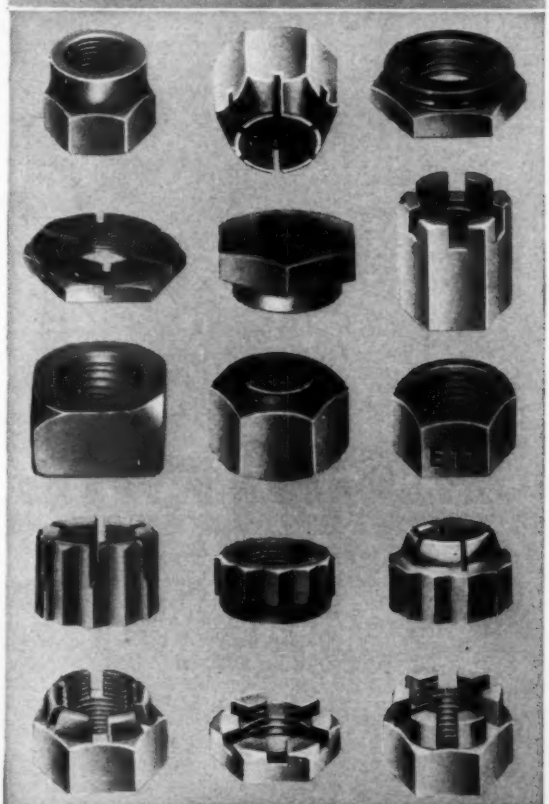
to specs. 3/8" - 4-1/4" cross flats

special machines + large stock of material x years of experience = speedy deliveries high quality low prices



Here are a few samples made to customers specifications . . . Our batteries of special high-speed multi-spindle, automatic machines make possible fast and accurate production of hexagon nuts of non-standard height and special shape from carbon or alloy steel, Naval bronze or other non-ferrous metals; also AN 310 through AN 335 as per latest Airforce specifications. Very often the special nut you require may be similar to one we are already making and a simple modification would result in a price advantage and quicker deliveries to you . . Send us your blueprint and particulars —let us quote on your requirements . . We also have a catalog that contains complete specifications, engineering data and prices regarding our standard nuts.

Manufacturer of Standard and Special
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. . . "Huglock" and "Conelok" locknuts.

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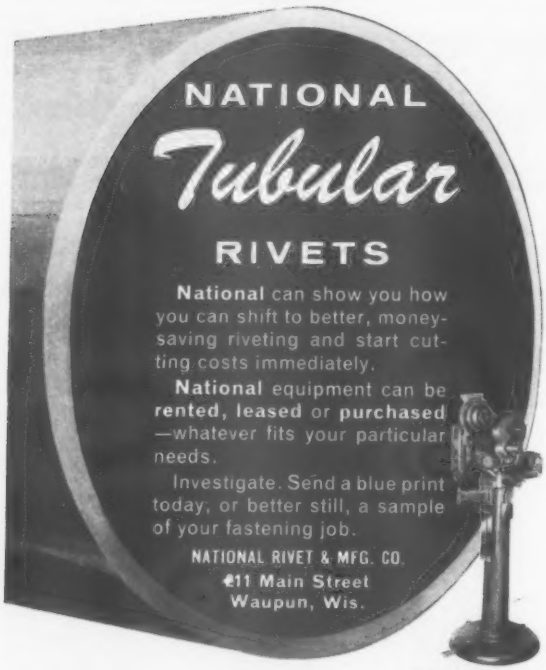
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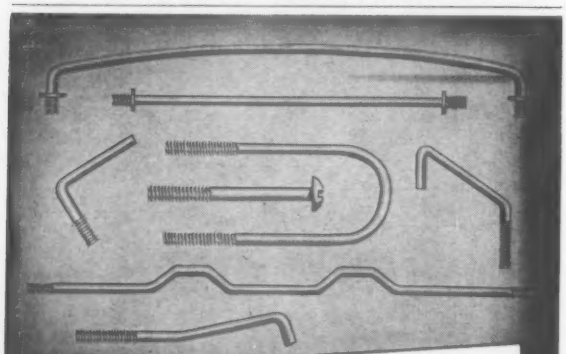

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SERVICE—QUALITY—UNIFORMITY

OHIO ROD makes Special Headed and/or Threaded Fasteners in short and long length – in short or long runs. Headed, Threaded, Collared, Bent, or Offset.

Send drawings or blueprints for quotes and literature.

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First it was the Gordon Little Company in 1914, then the Alpha Screw and Bolt Company in 1919 and a year later the present Sterling Bolt. E. B. Miller and P. T. Phillips, now vice presidents, were active in the formation stages.

From a Chicago basement operation the firm expanded to outgrow several locations. It now occupies 171,000 sq. ft. at 363 W. Erie St. with divisions all over the country. Herbert Gordon, son of the founder is now president.

DENISON FORMS NORTH CENTRAL REGION

A new north central sales region has been formed by the Denison Engineering Division of American Brake Shoe Company, Columbus, Ohio.

The region will be headed by D. J. Arnold as regional manager and will handle the sales and distribution of the company's Multipress and hydraulic pumps, motors and controls from its original office in Cleveland. The area covers the entire state of Ohio and parts of Michigan, Pennsylvania, West Virginia and Kentucky.

PASCHKE NAMED ROTOR TOOL SALES MGR.

Floyd L. Paschke has been named sales manager of The Rotor Tool Company, Cleveland, a subsidiary of The Cooper-Bessemer Corporation.

Paschke joined this manufacturer in 1941. During World War II he was service engineer for the company in the Cleveland area. In 1945, he was appointed district manager for Ohio. In 1956, Paschke was made western application engineer in charge of sales in the Midwest and Southwest.

PRECISION NUT EXPANDS OPERATIONS

In a move of expansion, the Precision Nut Co., Detroit, has transferred operations to Fraser, Mich., reports president Andrew S. Mihalik. The new location is 13 miles northeast of Detroit.

18-8 and 316

STAR STAINLESS SOCKET HEAD CAP SCREWS

Smooth and Knurled Types, Coarse, or Fine Thread. Sizes 0.80 and Up. Splined and Flat Head, Nylok and Socket Set Screws

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LENS TUNNEL FOR KODAK PHYSICS BLDG.

A 160-foot lens tunnel is one of many special research features being built into a new eight-story physics building at Kodak Research Laboratories in Rochester, N.Y.

The tunnel will be used in research on lenses and optical systems. Its length is essential because in testing a new lens design, an observer or instruments must be far enough from the light source to have it appear as a single point of light.

J. Clay Turk, supervising engineer of the project, said the tunnel is insulated and covered with three feet of earth to keep interfering heat waves to a minimum. He said the tunnel is located at basement level, outside the building proper, so it will be free of vibrations from street traffic that might affect delicate measuring instruments.

Another anti-vibration provision is that heating and ventilating motors will be kept to minimum size, Turk said. There are 16 fan rooms throughout the building, each

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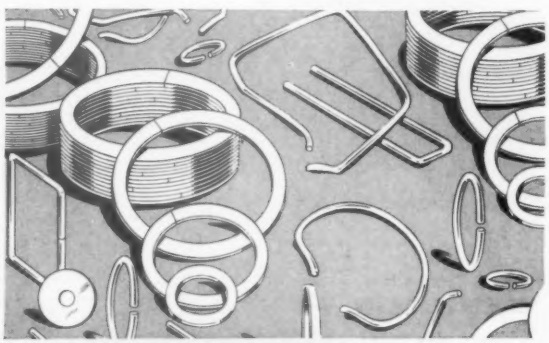

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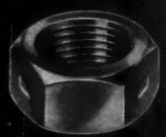
One piece all metal.



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Locking feature in the center for fast feeding. Can be applied from either end.

All types and sizes of Gripco fasteners listed in catalogue are available for immediate delivery.

Qualified fastener engineers are available for consultation on all your assembly problems.

GRIPCO CLINCH NUT
With or without Gripco Lock. For application to metal too thin to thread or for inaccessible assemblies. Hex collar prevents turning when torqueing bolt.

GRIPCO PILOT PROJECTION WELD NUT
With or without Gripco Lock. Centering collar positions nut and protects threads from weld spatter.

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- COLD FORMED SPECIAL NUTS OR PARTS TO PRINT.

GRIPCO COUNTERSUNK WELD NUT
With or without Gripco Lock. Countersink protects threads from weld spatter.

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exactly right for any job . . . and you can get them FAST

Dependable delivery — ample production capacity assures that you get any order, large or small, on schedule.

Uniform high quality — modern equipment and methods and rigid quality control guarantee precision quality.

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Moore set screws simplify design, purchasing, production. Send for price catalog.

MOORE SET SCREWS

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HIGH SPEED equipment for better production, lower cost

RIVETING HAMMERS

Available in 10 sizes. Handle full range of work up to 2" diameter solid rivets. Quick to set up or change tools. Available in bench and pedestal models. Backed by finest, most complete tooling service in the industry.

NOISELESS RIVET SPINNERS

Motor-driven, noiseless, rugged. Spindle travel adjustable. Fast cycle. Produces absolutely uniform assemblies. Model E (capacity 1/8") and Model G (capacity 5/16") available in both bench and pedestal models, foot or AIR operated.

ELECTRIC SOLENOID PUNCH

Stakes, rivets, marks, cuts off, bends, crimps, etc. with positive alignment. 4½" maximum vertical opening (2¾" minimum for tools and work). 1¾" spindle travel, adjustable downward. Fast cycle. 3500-lb. impact. Single or dual, hand or foot control.

AUTOMATIC STAKING MACHINES

Pressure pad built into spindle firmly secures work before blow. Allows for variation in thickness. Delivers uniform blow every time. Quick, easy adjustment, wide power range. 4 sizes—bench and pedestal models, foot and air operated.

We manufacture the most COMPLETE LINE of assembly machinery on the market today, so generally can recommend the CORRECT TYPE MACHINE for any assembly application.

FREE Assembly Engineering Service

Just send samples or blueprints of parts to be assembled. We'll recommend the right tools, procedure and equipment to use . . . without cost or obligation.

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room employing a relatively small, vibration-free motor.

An "optical penthouse" on the roof of the building will provide for study of such subjects as long-distance photography and the physical characteristics of sunlight. A railed, tiled area for outdoor experiments will also be located on the roof, Turk reported.

Especially important for electronics studies is a series of perfect electrical grounds, Turk said. Already installed, the grounds consist of 3" copper pipes sunk into bedrock outside the concrete footings. Low resistance ground cable extends to the electronics laboratories from the ground pipes. The tubes may be filled with treated water for a perfect connection to ground.

HUNTER SPRING ADDS DESIGN ENGINEER

Hunter Spring Company, a Division of American Machine & Metals, Inc., Lansdale, Pa., has appointed David R. Falvey as testing machine engineer. Mr. Falvey will take on engineering responsibility for Hunter's line of force measuring and testing equipment. Falvey is a mechanical engineering graduate of Yale University. His experience includes ten years of engineering with the Allison Company, The Budd Company, and Remington Rand Univac where he handled mechanical design and development projects.

BRISTOL MOVES CHICAGO OFFICE

The Chicago district office and warehouse of The Socket Screw Division of The Bristol Company is moving from present quarters in Chicago to 2040 N. Hawthorne Ave. in suburban Melrose Park. The new facilities will provide expanded office and warehouse space. The move is effective March 15.

SEND FOR YOUR FREE COPY!

TA's new Manual 210G gives you 94 pages of prints, tables, illustrations, specs and installation tips.

Save money for your company. Conserve your valuable time. Don't design clamps when TA offers you 40,000 of them to choose from at off-the-shelf prices!

This free manual shows all sizes and styles of loop clamps, bonding clamps, multiple clamps, center clamps, wire harness clamps, wave-guide clamps—plus blocks, brackets, busbars, line supports, and related items.

Sizes from 1/8" to 6" diameter in 16ths for bolt mountings from #4 to 3/8". Available in aluminum, steel, and stainless. All manner of high and low temperature insulation materials.

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KAYNAR APPOINTS O. J. HARPER SALES CO.

Left, Jack Lowe, vice-president, and O. J. Harper, right, president of O. J. Harper Sales Company are shown holding brochure and a new product (weldable dome nut in Harper's hand) recently developed by Kaynar Mfg. Co., Inc.

The O. J. Harper Sales Company, Renton, Wash., has been named Pacific Northwest sales agent for the Kaylock Division of Kaynar Mfg. Co., Inc., Los Angeles. O. J. Harper, president of the Harper Co., formerly served for 13 years in the Material Department, Boeing, Seattle. He formed his own company in 1954.

CHAMPION TO DROP MILD-STEEL ROD LINE

Champion Rivet Co., Cleveland, announced the termination of its domestic production of mild-steel welding electrodes April 1, 1960. The company will concentrate on specialty rods in alloy steels.

P-K's ELFENBEIN TO START AD AGENCY

Harold Elfenbein for the past 15 years marketing and advertising manager of Parker-Kalon, a division of General American Transportation Corporation, Clifton, N.J., has

continued

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with the BEAD CHAIN
ECONOMICAL
MULTI-SWAGE
METHOD
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LOWER PRODUCTION COSTS
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Bead Chain's exclusive multi-swage method automatically swages almost any type of tiny metal tubular part from flat stock into precision forms with positive, tight seams. High-volume production can be delivered speedily and at far less cost than with conventional methods of manufacture! Parts can be beaded, grooved, shouldered and made of almost any metal. Diameters up to ¼", lengths to 1½".
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Notice how specially designed strike, base and link have been adapted to gear mechanism. Ask for GEAR-LOCK clamp GL-101.

For mounting on flat surfaces. Ask for Hook type clamp HR-1.

CHOOSE FROM THE LINE THAT GIVES YOU MORE TO START WITH!

With more to choose from, you'll probably find just what you *need* to start with. The Bassick line of clamps and fasteners includes hook, loop, hinge, springloaded and gear-lock types as well as many special duty clamps.

The *real* beauty of the Bassick line is its unusual flexibility. We frequently adapt one of our many standard clamps or the component parts to *solve* specific customer problems—save money and time. Send for catalog: Bassick Clamps and Fasteners. It may well help obtain better fastening for *your* containers.

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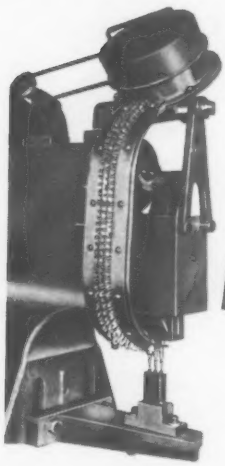

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You can do many fastening operations faster and more economically on Edward Segal Automatic Eyeleting Machines. Faster because a number of eyelets can be set simultaneously and rapidly. More economically because of the low cost of eyelets. And Segal machines are designed to give dependable, neat fastenings every time.

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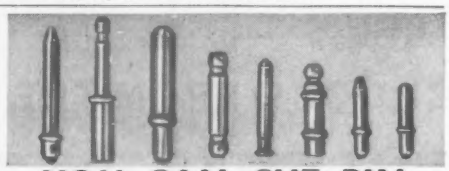

YOU CAN CUT PIN COSTS in HALF!

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AUTO-SWAGE

"the automatic swaging method"

Pins and small tubular parts made by Auto-Swage have saved up to 90%, savings of 35 to 65 percent are common. The automatic swaging method reduces metal, rather than cutting it away as by screw machine and eyelet operations, thus eliminating scrap. This factor, added to the high-speed of our special machinery, results in considerable savings to our customers.

Some of the parts we make are: connectors; pins for terminals, radio and fluorescent tubes; guide, shoulder, hinge, stop, and other pins, small eyelet or headed-type parts: shafts, studs, etc.

We also make Beaded Chain and accessories for many uses.

Send sketch, blue-print, or sample for further information on the economy in the automatic swaging method.

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271 CANAL STREET SHELTON, CONN.
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resigned. He will open his own advertising agency in northern New Jersey, on March 15.

HUCK NAMES MARINE INDUSTRY SALES DIR.

A. Joe Upton has been named assistant sales manager—marine industry for the Huck Mfg. Co., Detroit. He will direct sales engineering activities involving Huck's customers in shipbuilding and related marine industries.

Upton joined Huck in 1948 as a sales engineering representative. In 1957 he became a regional sales manager, the position he held at the time of his new appointment.

HUBBELL ADDS THREE SALESMEN

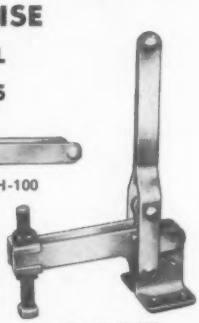
The Machine Screw Department of Harvey Hubbell, Inc., Bridgeport, Conn., has added three new sales representatives: Ohio: A. A. Imperial, Imperial Industrial Sales Co., Akron; Indiana and northern Kentucky: the James F. Roberts Co., Indianapolis; Florida: Courtney T. Cummings, P. O. Box 507, Bradenton.

VOI-SHAN ADDS CHIEF TECHNICAL REP.

LeRoy Oliver has joined Voi-Shan Manufacturing Company as chief technical representative. His responsibilities will cover technical sales, promotion, qualification, and field service.

Oliver joins Voi-Shan with 20 years of background experience in the fastening field. Previously he was employed by Elastic Stop Nut for eight years as sales engineer and with North American Aviation for nine years as a standards engineer. For the past three years he has been vice president and sales manager for Long-Lok.

ELIMINATE BUGABOOS OF CORROSION AND MAGNETISM WITH KNU-VISE STAINLESS STEEL CLAMPS



All shown ¼ actual size

Knu-Vise stainless steel toggle clamps eliminate frustrating magnetic attraction and corrosion while spot welding, or while working near acids.

The complete stainless steel line contains 18 clamps with either horizontal, vertical, or T-style handles. There are types for side mounting and pull clamps as well. Write today for complete information. A standard or a special Knu-Vise clamp will probably be the answer to your application.

SEE LAPEER EXHIBIT BOOTH NO. 726 A.S.T.M.E. SHOW.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS | **LAPEER MANUFACTURING CO.**

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1131 Pettit Road, Burlington, Ontario

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Index to Products Advertised

Accessories, power tool, 58
Adhesives, 82
Assembly line accessories, 92, 95
Assembly machines, 13
Assembly tools, manual, 30
Assembly tools, power, 23, 38
Bolts
  Bearing, 62
  Carriage, 14, 69, 78
  Eye, 69, 78
  Foundation, 90
  Hanger, 14
  Lag, 78
  Machine, 78
  Press, 3
  Sealing, 64
  Special, 69, 90
  Standard, 54 A-F, 69, 90, 98
  Stove, 14, 54 A-F, 75, 78
  Structurcl, 62, 90
  Toggle, 78
Brackets, 100
Brazing preforms, 99
Bushes, tension, 16
Clamps, 85, 100, 101, 102
Clips, 28
Cold heading, custom, 2d C., 70, 93, 95, 4th C.
Cold heading machinery, 59, 66, 70, 80
Drilling Machinery, 13
Eyelets, 86
Eyeletting machinery, 86, 102
Fasteners
  Aircraft, 6-7, 12, 17-20, 61, 87, 97, 98
  Blind, 20
  Cold headed, 2d C., 22, 43, 70, 93, 95, 98, 99, 4th C.
  Corrosion resistant, 61, 69, 88, 98
  Locking, 92
  Machined, 42
  Panel, 10, 18-19, 87
  Pawl, 10
  Quarter-turn, 10, 87
  Quick-release, 12, 17, 19
  Sealing, 10, 67, 75, 79
  Shaft retention, 56, 84, 92
  Snap, 86
  Special, 2d C., 22, 28, 64, 75, 88, 90, 93, 95, 97, 98, 4th C.
  Standard, 14, 22, 43, 54 A-F, 67, 71, 72, 78, 86, 90, 93, 95, 97, 99
  Structural, 62
  Weld, 99
Feeders, parts, 54
Ferrules, 86
Grommets, 86
Insert chaser, 76
Inserts, threaded, 3d C.
Latches, 10, 55
Lubricant, 92
Nuts
  Aircraft, 61
  Anchor, 10
  Blind, 26, 31
  Brass, 88
  Cap, 78, 94
  Castellated, 54 A-F, 97
  Clinch, 99
  Conduit, 94
  Dome, 3
  Finished, 78, 94
  Floating, 3
  Hex, 29, 54 A-F, 69, 78, 97
  Jam, 99
  Lock, 56, 61, 68, 77, 84, 94, 97, 99
  Machine, 14, 54 A-F, 78, 94
  Miniature, 88
  Preassembled w/washers, 29, 31
  Press, 3
  Sealing, 29
  Special, 26, 31, 42, 52, 88, 97
  Spring, 56, 94
  Standard, 48, 78, 97, 98, 99
  Turned, 88
  Weld, 31, 99
  Wing, 78, 94
Nut forming machinery, 59
Nut runner, power, 13, 23, 38
Nut setting machinery, 13
Packaging service, parts, 103
Parts, cold headed, 70, 95, 99
Parts, stamped, 42, 86
Parts, swaged, 101, 102
Parts trays, 95
Pins
  Cotter, 78
  Dowel, 16, 78
  Locking, 16, 97
  Quick-release, 12, 17
  Solid, 16, 71, 97, 102
  Spring, 16, 53, 60
  Taper, 16, 78
Pliers, 30
Plugs, 6-7, 79
Press, assembly, 2
Racks, portable, 95
Retaining ring dispenser, 25
Retaining rings, 4-5, 25, 42
Rivets, 10, 20, 24, 26, 64, 70, 74, 86, 96, 98
Riveting machines, 24, 74, 98, 100
Rods, threaded, 98
Screwdrivers, power, 13, 23, 94
Screws
  Cap, 6-7, 71, 72, 98
  Dowel, 14
  Drive, 14, 67, 70
  Locking, 6-7, 98
  Machine, 14, 54 A-F, 75
  Phillips, 67, 93
  Sealing, 64, 75
  Sems, 67, 93
  Set, 6-7, 36, 71, 72, 98, 100
  Special, 22, 64, 70, 75, 93, 4th C.
  Standard, 14, 22, 36, 43, 54 A-F, 72, 78, 93
  Tapping, 14, 67, 75, 78
  Thread-cutting, 67, 93
  Weld, 67
  Wood, 14, 75
Services, engineering, 2d C., 25, 26, 30, 47, 54, 70, 72, 74, 90, 97, 99, 100, 102, 3d C., 4th C.
Sockets, industrial, 58
Solenoid punch, 100
Springs, 42
Staking machinery, 100
Studs, weld, 65
Terminals, 86, 93
Thead-cutting die heads, 76
Thread rolling machinery, 59
Torque driver, 94
Torque wrench, 76, 96
Washers
  Belleville, 81
  Flat, 78, 86
  Lock, 78, 81, 93
  Special, 81
  Wrought, 78, 81
Welders, resistance, 2
Welders, stud, 65
Wire, brazing, 99
Wire, cold heading, 37
Wire drawers, 8
Wire forms, 28, 42
Wrench, ratchet, 38

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CONTENTS in this issue

Don't overlook these articles

FEATURES

32—Designing for Preform Brazing
Presenting 26 examples of metal joints which lend themselves to silver preform brazing.

39—High Strength Structural Bolting
Cost report shows why bolting is now preferred in structural steel fabrication.

44—Controlled Flexibility for Volume Assembly
Examples of material control and methods standardization.

48—Bonding Honeycomb Structural Material
A how-to-do-it article based on Monrovia Aviation's experience.

54—Why Tighten a Bolt?
Some factors to consider in preventing fatigue in fasteners.

57—Riveting and Bonding Door & Sash
Small firm finds blind riveting and bonding can cut costs and improve quality.

IDEAS AND REPORTS

21—Drill Setup Machines and Assembles
Six-spindle turret drilling machine drills, taps, fastens electronic parts.

21—Lock Screws Lick Vibration Problem
A Ruger revolver—fired 32,400 consecutive times—remains tightly fastened by five self-locking screws.

22—Clamps Aid Jet Engine Assembly
A vinyl barrier, held steady by stainless clamps, seals out dirt during final DC-8 engine assembly.

27—Brazing Carbide Tool Tips
G. E. electronic induction heating speeds tool tip brazing.

27—Bonded Transformer Cores Are Quiet!
How an epoxy adhesive dampens transformer hum, improves product.

28—Testing Crimped Terminals
Malco uses a force gage to standardize terminal tensile strength.

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A.P.M. CORPORATION 64
AJAX MANUFACTURING COMPANY, THE 8
ALLEN MANUFACTURING COMPANY 36
ALPHA MOLYKOTE CORPORATION, THE 92
APCO MOSSBERG COMPANY 96
ARO EQUIPMENT CORPORATION, THE 13
ATLAS SCREW & SPECIALTY COMPANY, INC. 22
AUTOMATION DEVICES, INC. 54
AUTO SWAGE PRODUCTS, INC. 102

BASNIK COMPANY, THE VINCE C. 95
BASSICK COMPANY, THE 101
BEAD CHAIN MANUFACTURING COMPANY, THE 101
BEHR MACHINERY & EQUIPMENT CORPORATION 70
BETHLEHEM STEEL COMPANY 90
BOOTS CORPORATION Third Cover
BRISTOL COMPANY, THE 71

C.E.M. COMPANY, INC. 60
CAMLOC FASTENER CORPORATION 87
CARR FASTENER DIVISION (United-Carr Fastener Corporation) 31
CHICAGO RIVET & MACHINE COMPANY 74
COOK & CHICK COMPANY 93

DETROIT STAMPING COMPANY 85
DEUTSCH FASTENER CORPORATION 17, 18, 19, 20
DRIV-LOK SALES CORPORATION 97

EASTERN MACHINE SCREW CORPORATION, THE 76
EASTERN STATES SALES COMPANY 78
EATON MANUFACTURING COMPANY (Reliance Division) 29
ELASTIC STOP NUT CORPORATION OF AMERICA 53
ELCO TOOL & SCREW CORPORATION Fourth Cover

FASTEX DIVISION (Illinois Tool Works) 92
FEDERAL MACHINE & WELDER COMPANY, THE 2
FISHER SPECIAL MANUFACTURING COMPANY 89

GAGNIER FIBRE PRODUCTS COMPANY 28
GARDNER-DENVER COMPANY 38
GILLEN COMPANY, JOHN 16
GOODRICH AVIATION PRODUCTS, B. F. (Div. of B. F. Goodrich Company) 26
GREAT LAKES SCREW CORPORATION 67
GRIP-NUT COMPANY 99

HARPER COMPANY, THE H. M. 69
HARTWELL AVIATION SUPPLY COMPANY 12
HASSELL, INC., JOHN 70
HIGH SPEED HAMMER COMPANY 100
HUBBELL, INC., HARVEY 43

ILLINOIS TOOL WORKS (Faxtex Division, Shakeproof Division) 47, 92

JACOBSON NUT MANUFACTURING CORPORATION 94

KEYSTONE STEEL & WIRE COMPANY 37
KLINCHER LOCKNUT CORPORATION 61

LAMSON & SESSIONS COMPANY, THE 62
LAPEER MANUFACTURING COMPANY 102
LEE COMPANY, THE 79
LUCAS-MILHAUPT ENGINEERING COMPANY 99

MID-CONTINENT SCREW PRODUCTS COMPANY 103
MILFORD RIVET & MACHINE COMPANY, THE 24
MINNESOTA MINING & MANUFACTURING COMPANY 82
MOORE, INC., GEORGE W. 100
MORRIS COMPANY, ROBERT E. (Rem Sales Inc.) 80

NATIONAL LOCK COMPANY 95
NATIONAL MACHINE PRODUCTS COMPANY (An SPS Company) 97
NATIONAL MACHINERY COMPANY 66
NATIONAL RIVET & MANUFACTURING COMPANY 98
NATIONAL SCREW & MANUFACTURING COMPANY, THE 75

OHIO ROD PRODUCTS COMPANY, INC. 98
OMARK INDUSTRIES, INC. 65

PALNUT COMPANY, THE 84
PARKER-KALON DIVISION (General American Transportation Corporation) 6, 7
PHEOLL MANUFACTURING COMPANY, INC. Second Cover

RAMSEY CORPORATION 4, 5
REM SALES, INC. (Sub. of The Robert E. Morris Company) 80
REPUBLIC STEEL CORPORATION 103
ROCKFORD SCREW PRODUCTS COMPANY 54A-F
ROSAN, INC. 3

INDEX TO ADVERTISERS

SECURITY LOCKNUT CORPORATION 68
SEGAL, EDWARD 102
SHAKEPROOF DIVISION (Illinois Tool Works) 47
SIMMONS FASTENER CORPORATION 55
SNAP-ON TOOLS COMPANY 58
SOUTHCO DIVISION (South Chester Company) 10
SOUTHERN SCREW COMPANY 14
STANDARD PRESSED STEEL COMPANY 77
STANDARD SCREW COMPANY 72
STANLEY-HUMASON, INC. 42
STAR STAINLESS SCREW COMPANY 98
STIMPSON COMPANY, INC., EDWIN B. 86
STURTEVANT COMPANY, P. A. 76

TA MANUFACTURING CORPORATION 100
THOMPSON-BREMER & COMPANY (Div. of American Machine & Foundry Co.) 93
THOMSON MANUFACTURING COMPANY, JUDSON L. 96
THOR POWER TOOL COMPANY 23
TINNERMAN PRODUCTS, INC. 56
TITAN TOOL COMPANY 94
TUBULAR RIVET & STUD COMPANY 52

UNITED CARR FASTENER CORPORATION (Carr Fastener Division) 31
UTICA DROP FORGE & TOOL DIVISION (Kelsey-Hayes Company) 30

WALDES KOHINOOR, INC. 25
WATERBURY FARREL FOUNDRY & MACHINE COMPANY, THE 59
WROUGHT WASHER MANUFACTURING COMPANY 81

THE HAPPINESS BINGE

One phrase became the trademark of the great entertainer, Ted Lewis, "Is everybody happy?" Inasmuch as it is any entertainer's job to spread happiness, the phrase was apt. However, somewhere along the line, aided and abetted by well-meaning social scientists, personnel managers, enlightened managers and management consultants, the question leaped from the stage into the factory, where it became the answer to all labor and production problems. "The happy worker is a good worker" was the new philosophy. Management went all out on a happiness binge and tried to form a happy family, and even in some instances, administered it paternalistically. Employee activities were organized, recreation rooms built, housekeeping and safety measures strengthened, managerial and supervisory attitudes tampered with, picnics, internal magazines and coffee breaks were introduced, insurance and retirement plans, and in some places, profit sharing plans were launched—all in an effort to make an employee happy.

And let us not say this has been wasted nobility and good money thrown down the drain after good intention. As a result of all this we live in a changed, and a better industrial world.

Yet, today, management's happy smile is slightly strained and the corners of the mouth are pulled down ever so little. There is doubt of the soundness of the basic premise that "a happy worker is a good worker." While many companies embraced this premise only because they saw in it a scheme to get more work without giving in return, others fell in with it because they experienced, after the war, a moral awakening (lacking in management during the twenties) to their social obligations which this new philosophy so nobly expressed.

What is wrong with this philosophy?

A person does not expect to be happy at work, nor must it be assumed that he would like to be. He works because he must; work is as inescapable as death and taxes. Those things which mean true happiness to a person are generally found outside of the factory or office, in other activities. He works only to be able to participate in these after-hour pursuits. Management cannot persuade workers to be happy at machines or desks regardless of coffee breaks, picnics, insurance, etc. Management can, to be sure, make work more tolerable, more agreeable. But the very idea that he, the worker, is about to be happy, or that measures are being instigated to surround him with bliss and joy, is not particularly appealing to him. It just isn't what he wants!

One of the basic needs to the worker (aside from wages), whether in office or plant, is Professional Recognition from his superior. He wants to be part of a group, a recognizable segment of a large whole and not merely an expendable cog who must be kept happy with a picnic. He wants to contribute, and wants the contribution appreciated. He wants and needs Job Satisfaction and work in harmony with definite, worthwhile, stated objectives. He wants Respect for his job, no matter how insignificant the job may be. The mere fact that the job needs doing makes it important and worthy of respect, and as long as management is paying him for performing the function it must be recognized. He wants Approbation when earned, and will not complain of the discipline, if deserved.

The one thing he does not want is to be overlooked or treated as inconsequential; he, too, wants to belong to the club. This does not apply only to the man on the machine, but also to the man in the next office. Happiness he can find outside of working hours, but Respect, Job Importance and Recognition, those are the vital pills which transform a worker into a colleague. Possibly, if management can slightly restate the happiness theorem and satisfy more basic human needs, management's face need not wear a strained smile.

Wm. J. Schleicher

Vice President & Editorial Director

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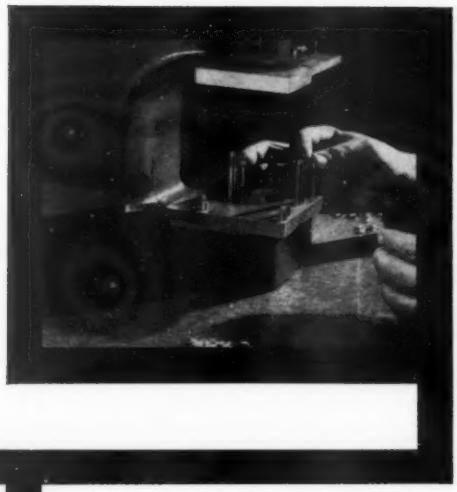

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